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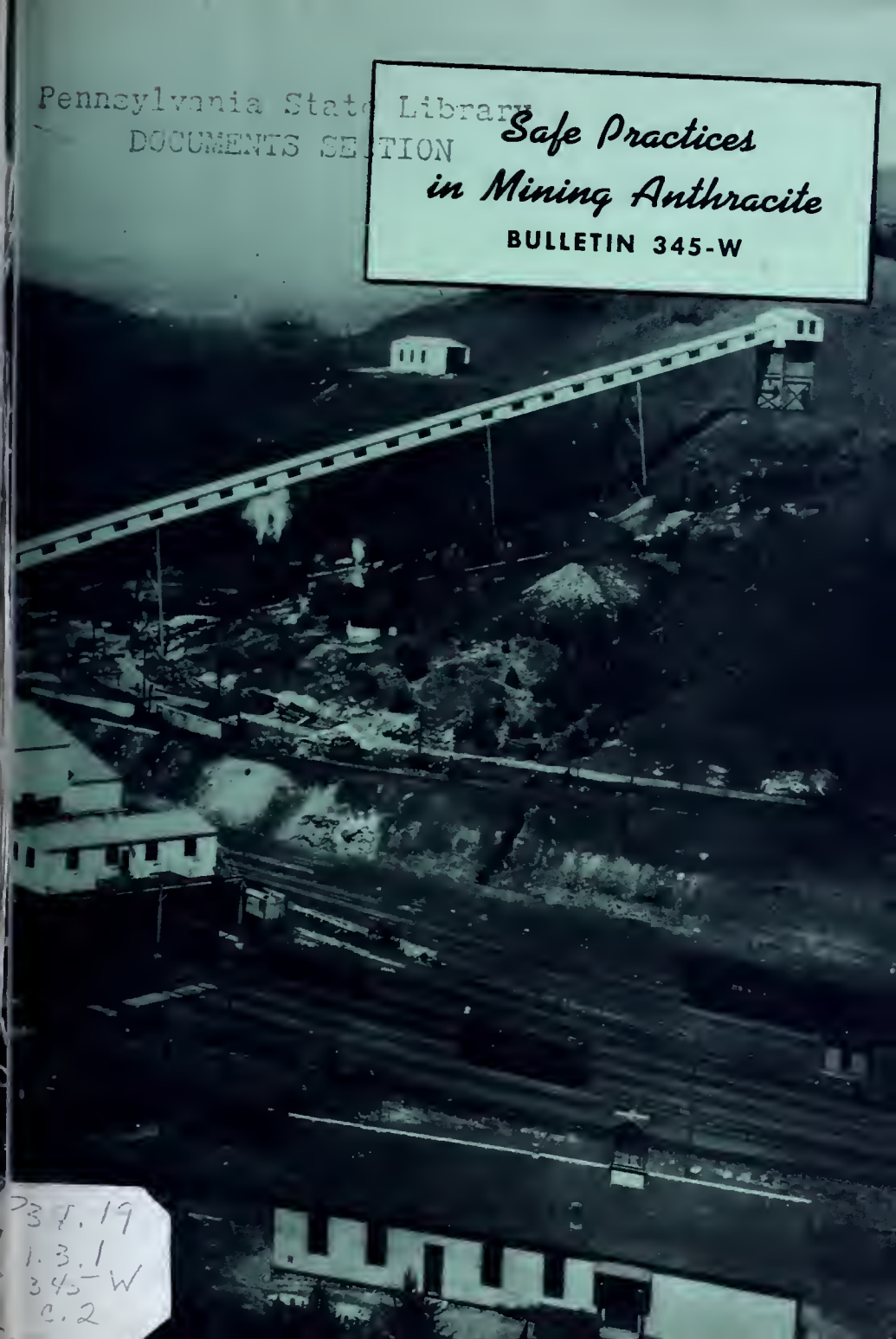
Safe Practices in Mining Anthracite

BULLETIN 345-W



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Vocational Training for War Production Workers

Safe Practices in Mining Anthracite

(A Manual of Instruction for On-the-Job Training)

BULLETIN 345-W

Prepared by the

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF PUBLIC INSTRUCTION
DIVISION OF INDUSTRIAL EDUCATION

In Cooperation with

PENNSYLVANIA DEPARTMENT OF MINES

SCHOOL DISTRICT, CITY OF POTTSVILLE
POTTSVILLE, PENNSYLVANIA

SCHOOL DISTRICT, CITY OF WILKES-BARRE
WILKES-BARRE, PENNSYLVANIA

and

UNITED STATES OFFICE OF EDUCATION
FEDERAL SECURITY AGENCY

Commonwealth of Pennsylvania
DEPARTMENT OF PUBLIC INSTRUCTION
Harrisburg

1944

FOREWORD

The increased demand for anthracite production, the depletion in the ranks of miners and miners' helpers, through entrance into the armed forces, and the subsequent necessity for training and upgrading workers to take places vacated by others have prompted the development of this instructional unit. This bulletin is intended for the use of miners and laborers, both on and off the job. Firebosses, foremen, and others may use the pamphlet as text material when instructing miners and laborers at the beginning of their work shift and at other appropriate instructional periods. The material is intended for those working at the mine face.

The units comprising this pamphlet have been organized and developed with the assistance of experienced mine inspectors, foremen, and assistant foremen, men who are expert in the various phases of the anthracite mining industry. The procedures presented are generally those which, under normal conditions, are followed in anthracite mines. These procedures conform to modern mining regulations within the meaning of State laws pertaining to anthracite mining.

Acknowledgment is extended to mine operators in the anthracite coal region for assistance in making the preliminary analysis and in preparing the instructional materials.

The cooperation and professional assistance of the Honorable Richard Maize, Secretary, Pennsylvania Department of Mines, and the Honorable Joseph J. Walsh, Deputy Secretary, Pennsylvania Department of Mines, are gratefully acknowledged. Special acknowledgment is extended to Frank Kettle, Mine Inspector, 13th District; to W. J. Clements, Mine Inspector, 17th District; to James F. Munley, Mine Inspector, 1st District; to Daniel H. Connelly, Mine Inspector, 8th District; to Willard

Ward, Mine Inspector, 3rd District; to T. L. Wackley, Mine Inspecto 2nd District; to Andrew Wilson, Mine Inspector, 7th District; and t Robert O. Schneider, Mine Inspector, 22nd District, all of the Pennsyl vania Department of Mines, who materially assisted in the preparatio of instructional materials.

Further acknowledgment is extended to R. B. Hewes, Assistant Supe visor, Coal Mining Extension Training, The Pennsylvania State Colleg State College, Pennsylvania, for reviewing and criticizing text conten

Appreciation is extended to the Pottsville Board of Education and t school officials who cooperated in the preparation and publication of thi bulletin. The assistance of the Wilkes-Barre School District is als acknowledged.

The preparation of this bulletin was supervised by Charles Johnsto Adviser, Division of Industrial Education, with the assistance of Herbert Kissinger, Area Coordinator of Industrial Education, and Ed ward F. Marburger, Director of Vocational Education, Pottsville. Th work was completed under the direction of Charles F. Zinn, Chie Trade and Industrial Education, and Paul L. Cressman, State Directo of Vocational Training for War Production Workers.

FRANCIS B. HAAS
Superintendent of Public Instructio

November, 1944

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DIVISION I

Introduction

1. Importance of the Anthracite Mining Industry

Anthracite mining is of great importance to the nation and to the persons who are engaged in it. The following table shows the importance of anthracite mining to the mine workers, the mine operators, and to workers in other industries.

PENNSYLVANIA COUNTIES PRODUCING ANTHRACITE — 1938

County	*Land Area in Square Miles*	*Total Population*	*Total Number of Persons Employed*	*Persons Employed in Coal Mining*
Carbon	406	61,735	18,828	4,820
Columbia	479	51,413	16,766	1,922
Dauphin	522	177,410	64,975	1,021
Lackawanna	451	301,243	81,165	17,874
Lebanon	360	72,641	27,572	35
Luzerne	892	441,518	119,951	44,959
Northumberland	454	126,887	61,891	7,397
Schuylkill	777	228,331	58,843	18,671
Sullivan	458	7,504	1,839	72
Susquehanna	824	33,893	9,654	42
Wayne	739	29,934	9,419	20
Total	6,362	1,532,509	470,903	96,833

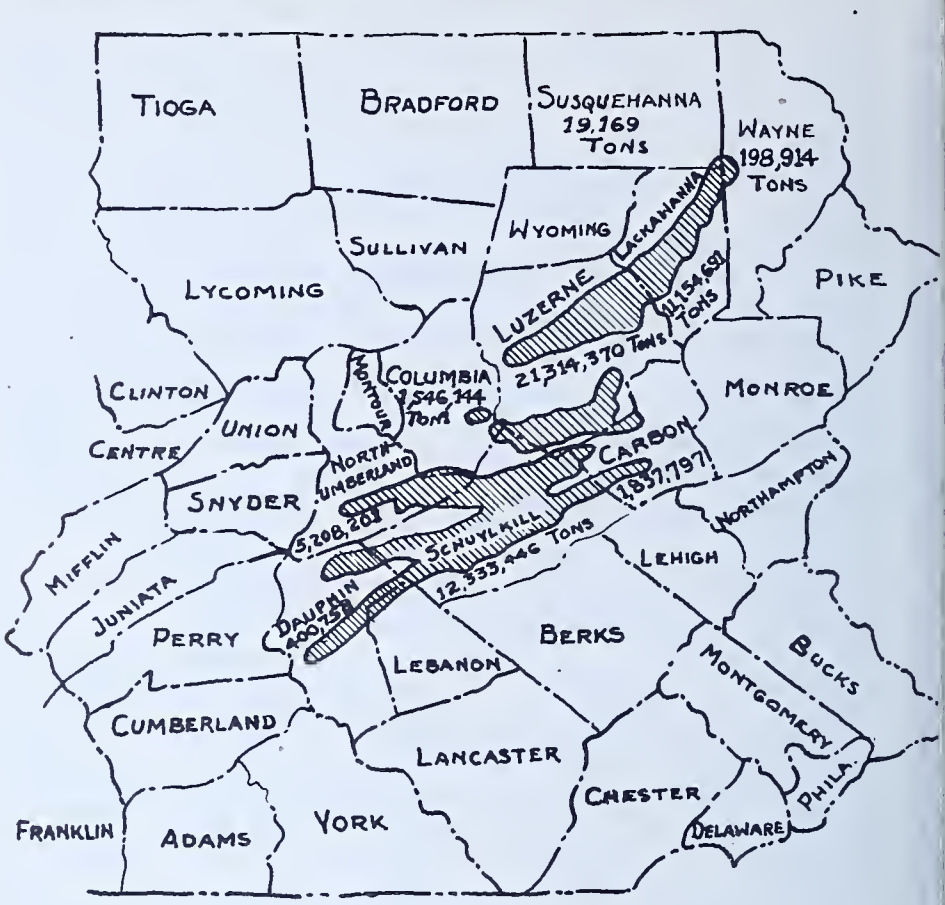

FIG. 1 — *Map of Anthracite Area in Penna.*

There are 627 coal mines in operation.

$1,505,349,545.42 were paid in wages and salaries to mine worker in the past ten years.

535,711,582 tons of coal were mined in the past ten years.

$2,357,130,960.80 was the total cost of mine operation during th past ten years. The mine operators paid this bill.

2226 fatal accidents occurred during the past ten years.

132,000 compensable non-fatal accidents occurred during the past ten years.

$48,214,042.38 was the cost to the mine operators for fatal and non-fatal accidents during the past ten years. The mine operators paid this bill.

The mine workers paid with their lives, with their lost time and with their suffering.

If there had been no accidents during the past ten years, it is estimated the increase in the production of coal would have been 41,800,000 ons.

This amount of coal could have been used to good advantage in the usiness of the nation and in the heating of homes. The mine workers vould have received over twelve millions of dollars in wages and alaries and the mine operators would not have had to pay a bill of 48,214,042.38, four times as much as the mine workers lost.

The anthracite industry is extremely important.

To the individual — It means his living.

To the operator — It represents a large investment.

To the community — Because any community is held together by pportunity for service to members of that community. Read carefully ie entire content of this pamphlet, learn why every mine worker is bligated to himself, to his family, and to his community to work safely.

. Mining Requires Training and Experience

A worker must have two years of experience as a mine laborer before e can take the oral examination given to all candidates for a "Miner's ertificate."

(See Pennsylvania Anthracite Mining Laws, PL 287, approved July , 1897, Section 5, Page 78.)

QUALIFICATIONS OF APPLICANT FOR CERTIFICATE OF COMPETENCY

"All persons applying for a certificate of competency, to entitle them to be employed as miners, must produce satisfactory evidence of having had not less than two years' practical experience as a miner, or as a mine laborer in the mines of this Commonwealth, and in no case shall an applicant be deemed competent unless he appear in person before the said board and answer intelligently and correctly at least twelve questions in the English language pertaining to the requirements of a

FIG. 2 — *Saving for Tomorrow*

practical miner, and be properly identified, under oath, as a mine laborer by at least one practical miner holding miner's certificate."

After reading this section of the law it should be clear that only those persons who have applied themselves during this two-year period, will be considered capable of performing the duties of a miner. Each additional year the miner works should make him in every way more capable of performing duties as a miner. It is just like putting money in the bank; each year the bank-roll gets a little larger and each year a man works he gains more experience.

The intelligence and skill which a man must have before he can qualify for a certificate as a miner indicates that miners are rated very highly as industrial workers.

A large number of industrial workers are employed without having to be certified to do any special job. These jobs do not require the

No. 5689 Act of July 15, 1897

Anthracite Miner's Certificate

Sub-Board No. 2 of First District

CERTIFICATE OF COMPETENCY

TO WHOM IT MAY CONCERN:

This Is To Certify That JOHN DOE of OLYPHANT, PA.

FIRST ANTHRACITE COAL DISTRICT OF PENNSYLVANIA, having appeared before us this 19 day of JULY, 1944, and having been duly examined by us is hereby declared competent to be employed as a Miner in the Anthracite Coal Mines of this Commonwealth, agreeably to the Act of Assembly of July 15, 1897, entitled, "An Act to Provide for the Examination of Miners in the Anthracite Region of this Commonwealth, and to Prevent the Employment of Incompetent Person as Miners in the Anthracite Coal Mines."

Weight 160 Color of Hair BLACK Color of Eyes BLUE Age 30

Height 5' 8" Identified by JOHN SMITH

SUB-COMMITTEE John Simonsky, John Brown, John Jones

Issued at Olyphant, Pa., this Nineteenth day of July 1944

Birthplace Olyphant Pa

FIG. 3 — *Miner's Certificate*

skill and knowledge that a mine worker must have and the men who work at these jobs are not rated as highly skilled. Even college graduates in Mining Engineering are not qualified miners. They still must have two years' experience in an anthracite mine before they can qualify to take the examination and be certified as a miner.

Every person who works for a living should consider his future. A man would be very foolish if after several years of saving, he threw away his bank-roll. Is he not as foolish if he throws away his life? If

FIG. 4 — *Sound Reasons for Working Safely*

a miner is smart he will not take chances and throw away several years of hard work. There is just as great a future in mining as in any other industry. If a person cannot work safely on his job and cooperate with others in one place, there is not much chance that he will do better on any other job. Some of the greatest present-day industrial leaders have risen from the lowest mine job.

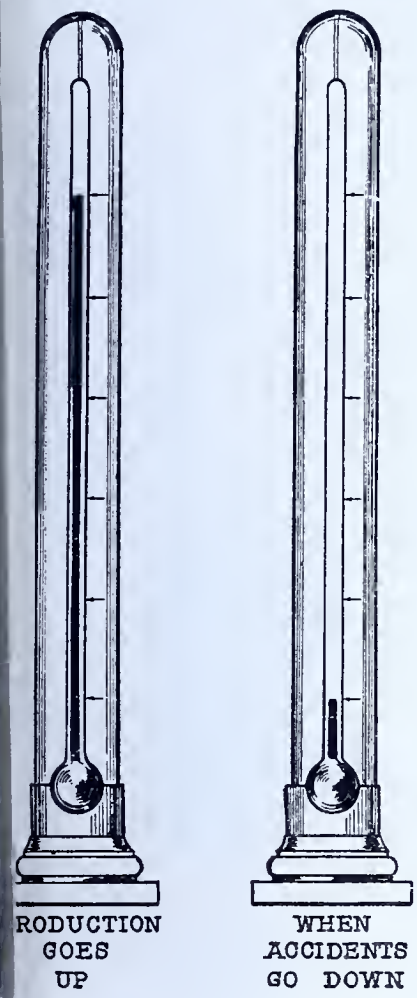

FIG. 5 — *Careful workers have larger earnings*

3. Several Sound Reasons Why the Miner Should Work Safely.

a. It is the moral duty of any man to consider the welfare of his wife and family. They depend for their living on the husband and father. Therefore, the miner or laborer must safeguard himself in every possible way to protect his life and limbs so that he may continue to earn a living at his job.

b. A compensation check is not enough to pay household expenses, rent, food, clothing, and doctor bills.

c. Lying in a hospital bed suffering with a broken leg, arm or back, does not help to produce coal.

d. A miner is never as good a man physically after an injury as he was before he was injured.

e. Other workers follow the example of experienced men. A man can be lucky once in doing something dangerous but when another man follows his example and is injured, or killed, he is largely responsible for the other man's injuries. Feeling sorry when a man is injured does not help him. A good example is the thing that counts.

f. The average man enjoys life but he can only enjoy it to the extent that he is able to be useful in the community in which he lives. It is only after a man becomes seriously injured that he fully appreciates good health and a sound body.

DIVISION II

Safe Practices in Care and Use of Tools and Equipment

FIG. 6 — *Plunger Type Blasting Battery*

NOTE: This DIVISION is intended for the instruction of persons who have no knowledge of the care and use of mining tools and equipment. However, it will be worthwhile for those who are familiar with the use of mining tools and equipment to read this DIVISION and check their procedure with the instructions which follow:

1. Miner's Tool Kit

(Items owned by the miner)

a. BLASTING BATTERY

(Figs. 6 and 7)

The blasting battery is used to fire blasts.

SAFE PRACTICES WHEN USING A BLASTING BATTERY

(1) Use an approved blasting unit.

(2) Keep the blasting battery always in a locked box, in a dry place, when it is not in use.

FIG. 7 — *Twist Type Blasting Battery*

(3) Have the blasting battery tested at least once every three months.

(4) Disconnect the wires from the battery immediately after the shot is fired. Twist the ends of the wires together and lock the battery in its box.

(5) Disconnect the wires from the battery when the charge misses fire; twist the ends of the wires together and lock the battery in the box.

Dry or wet batteries of the exposed terminal type are positively prohibited.

b. FIRING LINE (Fig. 8)

The firing line is used to conduct electric current from the blasting battery to the detonators.

SAFE PRACTICES WHEN USING A FIRING LINE

(1) When using a portable firing line:

(a) Wind the wires on a reel or a drum (spool).

(b) Twist together the ends of the wires that are to be connected to the battery.

The wires, when twisted together, form what is called a "shunt". See Fig. 8.

The shunting (twisting together) of firing lines minimizes the possibility of premature blasts.

FIG. 8 — *Firing Line Mounted on Insulators*
(Note the Shunted Circuit)

(c) Hang the firing line on well-installed insulators wherever possible. This practice also prevents the line from becoming charged.

Dragging the firing line over the floor causes it to become charged with electricity and also the insulation becomes damaged.

(d) Provide insulators that are secure but from which the firing line can be removed quickly and easily when winding it on the drum or spindle after the blast has been fired.

(2) When using a permanent firing line:

(a) Provide insulators that are secure.

(b) Provide a shunt box about the middle of the firing line.

(c) Carry the firing line from the shunt box to a point about twelve (12) feet from the working face.

Make the firing line secure to the insulators.

(d) Shunt the open ends of the firing line until the charge is to be fired, both at shunt box and at firing station.

(e) Construct the firing line of No. 16, rubber covered stranded copper wire.

(f) Inspect the firing line often for worn or broken insulation and for correct fastening to the insulators.

Remember there is always danger that gas may collect overnight and if the firing line is not kept in good condition there is a possibility that the gas may be set off on account of a spark.

(g) Never allow a firing line to contact pipe lines, rails, cars, shaker chute pans, etc., or surfaces of working places.

(h) Keep firing line on opposite side of other sources of electric power.

Items *g* and *h* apply whether the line is portable or permanent.

2. Tools and Equipment

(Items owned by the company)

a. DRILLING TOOLS

Drilling tools are used to drill holes in coal or rock.

(1) Hand Machine (Fig. 9)

Fig. 9 — *Hand Machine*

Safe Practices When Using a Hand Machine

(a) Keep the machine in good working condition by correct use and lubrication (oiling).

(b) Use only:

(1) A sharp, straight auger drill or drill bit (correct size).

(2) A straight standard bar.

(3) A good thread box and thread bar.

(4) A drill gauge of the correct size for the cartridge that is to be inserted in the drilled hole.

(5) Use cotter pins at connections.

CAUTION: Many men have injured themselves when using a hand machine that was in poor condition.

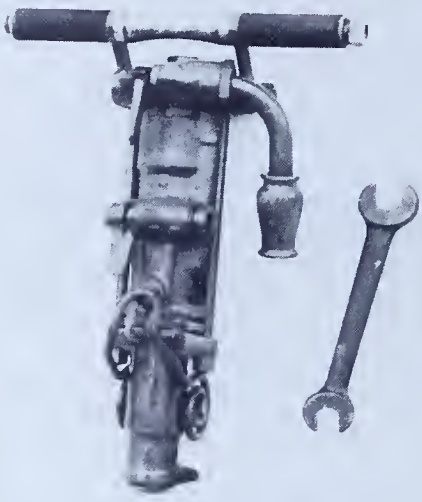

FIG. 10 — *Jack Hammer*

A straight standard bar helps to make a straight hole.

When the standard bar becomes bent the hole will be curved or it will run crooked. The hole will be the right size perhaps but due to the uneven direction the cartridges will bind (stick) when they are inserted. Now what happens when a cartridge sticks? There is considerable danger when this condition exists. If the tools are kept sharpened and in good working condition, the miner will be able to work much easier and, of course, produce more coal with less effort.

(2) JACK HAMMER (FIG. 10)

SAFE PRACTICES WHEN USING A JACK HAMMER

(a) Never try to operate a jack hammer when the air pressure is low.

(b) Keep all moving parts clean and well lubricated (oiled).

(c) Use gaskets at hose connections.

CAUTION: Many men have injured themselves trying to make a jack hammer do the work when it was in poor working condition. When the machine sticks and the miner attempts to get it loose, he may be pushing or pulling just as the machine lets go and starts to work again. This sort of condition can cause a serious injury. Do not take chances. Keep the machine in good condition.

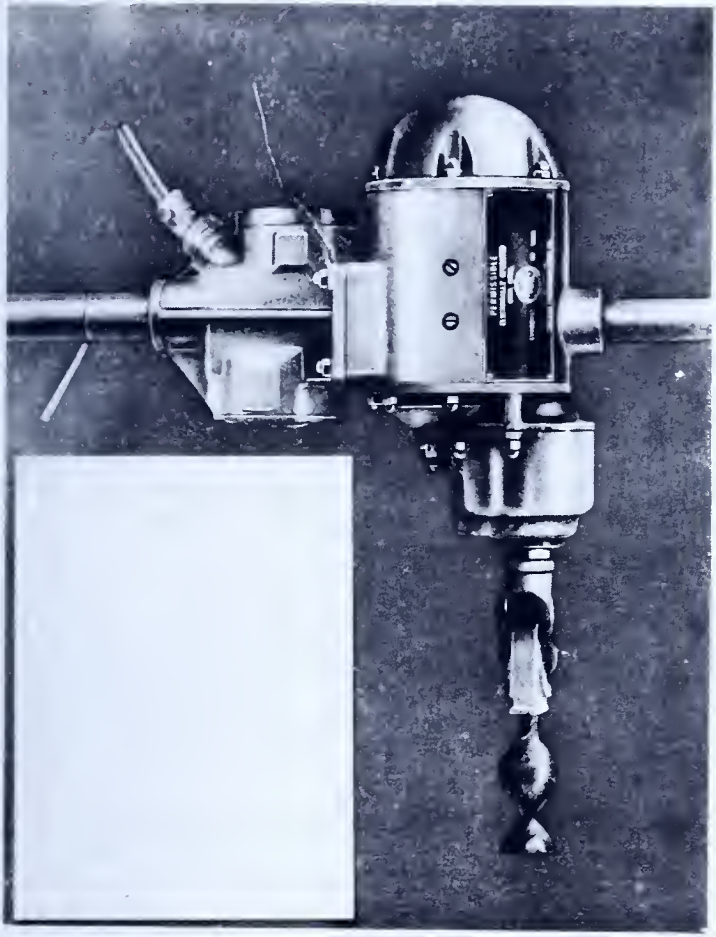

Fig. 11 — *Electric Drill*

(d) Never use a jack hammer until the roof and sides of the working place are absolutely safe. The heavy vibration caused by the operation of the hammer will jar loose any weak or drummy surfaces. The falling material that follows will be extremely dangerous.

(e) Always wear goggles when operating a jack hammer.

The compressed air drives the drillings and dust particles from the hole with great force. Serious eye injuries have resulted when the worker was not wearing goggles.

(f) Check the drill bits for size before drilling the hole too deep.

(3) Electric Drill (Fig. 11)

Safe Practices When Using an Electric Drill

(a) Always use an electric drill that is of an explosion proof type.

If there is explosive gas in the working place and the worker should use an electric drill that was not explosion proof, the gas could be ignited, and a bad explosion would result.

(b) Inspect an electric drill often to see that the permissible standards are maintained.

When an electric drill is not inspected often it is as dangerous as a gun when no one knows whether or not the gun is loaded.

(c) Inspect the power lines to these electric drills.

The power lines must be well insulated to prevent the possibility of an electric spark causing a fire or a gas explosion.

(d) Insert and secure cotter pin at chuck connections and protect with a chuck guard.

b. ROOF TESTING BAR (Fig. 12)

The roof testing bar is used to strike against the roof, rib, and face to determine whether the condition of the working place is safe for the miner and laborer.

Safe Practices When Using a Roof Testing Bar

1) Use a steel testing bar that is about 1″ diameter and at least twelve (12) inches shorter than the distance from the bottom to the roof.

2) Start at a safe point (at the edge of the old roof) and move slowly along the new surface area of the working place.

(3) Test the roof and walls by striking against them with the end of the steel bar. See Fig. 12.

Fig. 12 — *Roof Testing Bar*

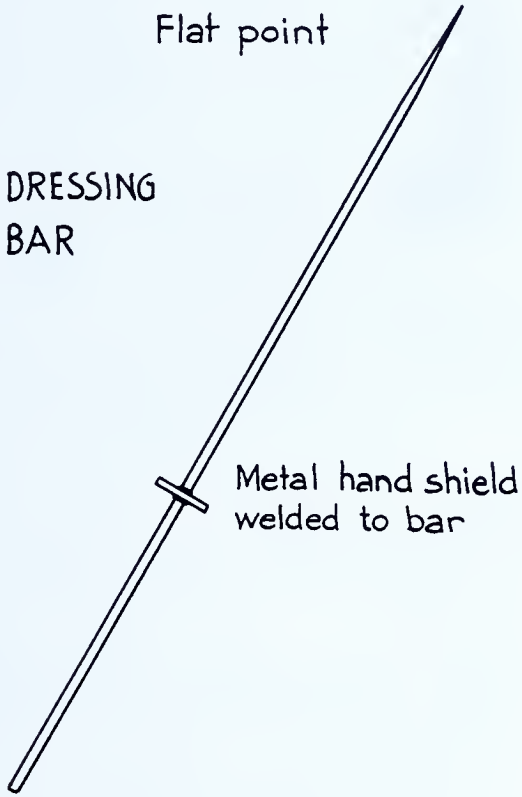

Fig. 13 — *Barring Drill*

(4) Listen, feel with the fingers of one hand, to detect any vibration, and watch for anything that may cause injuries to the miner or his laborer.

(5) At the least sign or sound of an unsafe condition, take the necessary steps to remove the danger.

See DIVISION IV Section 1, Item b.

(6) Test roof above layer of rock that has been taken down.

c. MINER'S BARRING DRILL (Fig. 13)

The miner's barring drill is used to pull down loose roof and ribs. It is usually 5½′ to 6′ long, about 1¼″ in diameter, flattened on one end to a chisel point. This barring drill may be used to test roof and ribs if the thickness of the seam will permit.

Safe Practices When Using a Barring Drill

(1) Stand in a safe place when inserting the chisel point to pull down loose material from the roof or ribs.

(2) Warn other workmen to stay out of danger.

(3) Test roof immediately overhead before using the barring drill.

d. HAMMER (Fig. 14)

The hammer is used to:

(1) Break large pieces of rock to make them easier to handle when loading.

(2) Drive spikes into ties when laying track.

(3) Drive cap pieces over top of props and to drive wedges over top of cross timbers.

There are many other similar uses for a hammer. A hammer appears to be such a simple type of tool that to mention it seems

IG. 14 — *Two Different Sized Hammers*

rather unnecessary. Severe injuries may be caused by careless use of a hammer and the following suggestions on how and when to use a hammer are given for the benefit and guidance of mine workers.

Safe Practices When Using a Hammer

(1) Never use a hammer that has a loose or split handle. A weak handle can be the cause of a serious injury. Keep the handle in first-class condition.

Fig. 15 — *Miner's Axe*

(2) Take a good grip on a hammer handle so that it does not slip out of the hand and cause injuries.

Be sure there is room to use a hammer. If the hammer strikes an obstruction instead of the place intended, it can glance or slide off and thus cause injuries.

Nails and spikes should be hit squarely.

Wear goggles when using the hammer to break chunks of coal and rock, to drive nails or spikes, and to drive wedges or a bar. Flying fragments of coal and rock or splinters from spikes and other metal may cause injuries to the eyes and exposed parts of the body (face, hands,) and goggles must be worn for complete protection to the eye.

(6) Keep the striking faces of the hammer flat. The edges should not be rounded because this condition causes the hammer to slip and slide off the surface or object. Keep these faces in good condition.

e. AXE (Fig. 15)

The axe is used to:

(1) Trim cap pieces to proper size and shape.

(2) Frame collars and legs for cross timbers.

(3) Butt ends of props to fit into bottom hitches.

(4) Drive nails into boards when erecting brattice.

Safe Practices When Using an Axe

(1) Never use a dull axe with which to cut timbers.

(2) Keep the axe sharpened for immediate use when necessary. Attempting to cut timbers with a dull axe usually results in a very poorly trimmed job or, in some cases, an injury.

(3) Do not wear a glove on the hand holding the axe.

(4) Do not use an axe handle more than 20 inches long (one-hand practice).

f. ADZE (Fig. 16)

The adze is used to frame collars and legs for cross timbers.

Fig. 16 — *Miner's Adze*

Safe Practices When Using an Adze

(1) Keep the blade sharpened.

(2) Be sure the handle is secure when using an adze.

(3) Straddle a collar when using an adze to cut to shape.

FIG. 17 — *Trimming a Leg to Fit the Collar*

g. CROSSCUT SAW (Figs. 18 and 19)

The crosscut saw is used to cut props, collars and legs to the correct length.

FIG. 18 — *Two-Man Crosscut Saw (For Heavy Jobs)*

FIG. 19 — *Crosscut Handsaw (For Light Jobs)*

FIG. 20 — *Miner's Pick*

SAFE PRACTICES WHEN USING A CROSSCUT SAW

(1) Never attempt to use a dull saw.

(2) File the teeth sharp, set them correctly, and keep the saw in a safe place. A little machine oil is good when rubbed on the saw blade to prevent the formation of rust.

(3) Never allow the saw teeth to strike metal, rock, or coal when sawing timbers. One such stroke often is enough to dull the saw.

(4) Be careful to not force the saw through the work. Find the trouble and correct it. A saw that has been bent (upset) will never again be as good as before.

(5) Never use the hand as a guide for starting the saw in a cut.

h. MINER'S PICK (Fig. 20)

The miner's pick is used to:

(1) Make hitches for props and timber legs.

(2) Break chunks of coal.

(3) Secure the ribs and face (dressing down) in pitch mining.

Safe Practices When Using a Miner's Pick

Fig. 21 — *Tamping Stick (Wood)*

Fig. 22 — *Copper-tipped Drill*

(1) Keep the points of the pick sharp at all times.

(2) Use only a pick with a strong handle.

(3) Be sure the handle is securely anchored in the pick.

(4) Wear goggles when using a pick.

j. TAMPING STICK (Fig. 21)

The tamping stick is used to:

(1) Push charges of explosive into back of hole.

(2) Place tamping bags against explosive charges.

Safe Practices When Using a Tamping Stick

(1) Never use a tamping stick that is part wood and part metal.

(2) Always use a tamping stick of the same diameter for the entire length; a pointed tamping stick is dangerous.

k. COPPER-TIPPED DRILL (Fig. 22)

The copper-tipped drill is used to:

(1) Push charges of black powder into back of hole.

(2) Place tamping bags or tamping against black powder charges.

Safe Practices When Using a Copper-Tipped Drill

(1) Keep copper tip fastened tightly to the steel drill.
(At least 6″ of copper)

1. COPPER NEEDLE (Fig. 23)

Safe Practices When Using a Copper Needle

The copper needle is used when blasting with black powder.

Procedure:

(1) Insert black powder into bore hole.

(2) Use copper-tipped drill and push black powder to back of hole. (See Fig. 58).

(3) Puncture, with the copper needle, the front end of charge of black powder. The copper needle remains in this position while the rest of the bore hole is filled with non-combustible material. Never use a bent copper needle.

(4) Press the non-combustible material into place with the copper

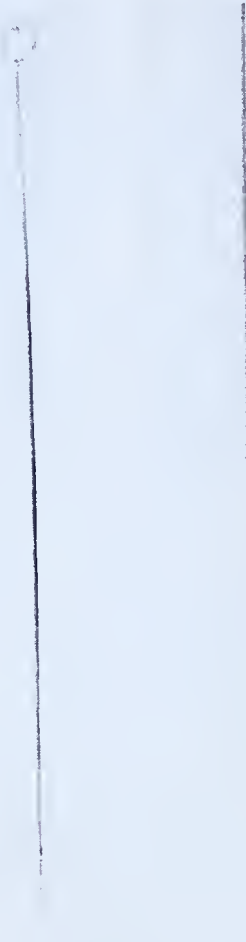

Fig. 23 — *Copper Needle*

Fig. 24 — *Miner's Scraper*

tipped drill. The copper-tipped drill has a groove which fits over the needle.

5) Fill the bore hole to the mouth of the hole.

6) Remove carefully the copper needle. The removal of the copper needle leaves a small opening from the mouth of the hole directly into the charge of black powder.

7) Insert a squib into this small opening. When the squib is ignited, the fire travels through the opening to the charge of powder and causes the powder to detonate.

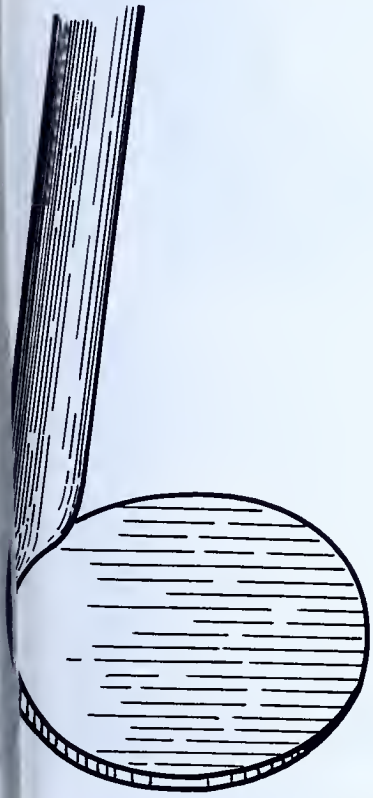

FIG. 25 — *Scraper End*
(Enlarged end of scraper)

m. SCRAPER (Fig. 24)

The scraper is used to clean out the particles of fine coal which are left in the hole after drilling. Fig. 25 shows how the end is shaped.

SAFE PRACTICES WHEN USING A SCRAPER

(1) Never use a bent scraper.

(2) Never use a metal scraper to tamp a hole.

n. SHOVEL (Fig. 26)

The shovel is used to load the coal and rock.

SAFE PRACTICES WHEN USING A SHOVEL

(1) Use a flat back shovel in low seams.

(2) Never place large chunks of material on a shovel.

FIG. 26 — *Miner's Shovel*

o. METAL WEDGE (Fig. 27)

The metal wedge is used to:

(1) Assist in breaking large pieces of coal and rock.

(2) Assist in taking down bad pieces of rock from the roof.

SAFE PRACTICES WHEN USING A METAL WEDGE

(1) Remove mushroom shape from the head of the wedge as soon as it begins to form.

(2) Keep the edge of the wedge sharpened.

(3) Wear goggles when driving wedge.

FIG. 27 — *Metal Wedge*

FIG. 28 — *Tie Lifter or "Devil"*

p. TIE LIFTER (Fig. 28)

The tie lifter is commonly called "DEVIL" and it is used to hold up a tie against a mine rail in order to drive in the spikes.

SAFE PRACTICES WHEN USING A TIE LIFTER

(1) Keep the lifter in alignment with the tie.

(2) Hold the tie firmly up to the rail when driving spikes.

q. TRACK GAUGE (Fig. 29)

The track gauge is used to keep the mine rails the correct distance part when they are being laid on the ties.

SAFE PRACTICES WHEN USING A TRACK GAUGE

(1) Do not strain or otherwise misuse a track gauge.

(2) Check the gauge for correct measurement before using it.

(3) Never leave a track gauge lying around to become lost or damaged.

FIG. 29 — *Track Gauge*

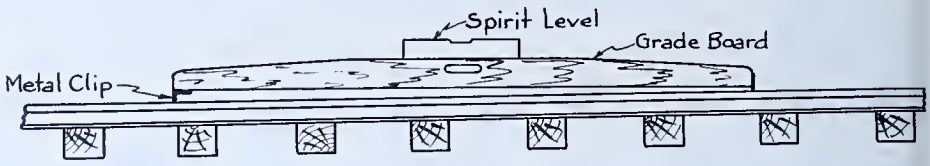

FIG. 30 — *Grade Board*

r. GRADE BOARD (Fig. 30)

The grade board is used when a gangway mus be driven at a given grade. Since a grade board i used to maintain the pitch or grade of the trac and thus make certain the pitch or grade is not to much or too little, the mine worker must be sur to use the correct grade board for the job. Note th metal clip fastened at the end of the board. An accu rate spirit level must be used with the grade boar

SAFE PRACTICES WHEN USING A GRADE BOARD

(1) Keep the grade board in the proper gaug (See that the clip is of the correct dimension)

(2) Be careful not to strike others when carryin or swinging the grade board.

FIG. 31 — *Powder Primer Punch*

s. POWDER PRIMER PUNCH (Fig. 31)

The powder primer punch is made of wood. is used to punch a hole in the explosives to perm the insertion of a detonator.

SAFE PRACTICES WHEN USING A POWDER PRIMER PUNCH

(1) Use a wooden primer punch.

(2) Select a primer punch of the correct gauge.

t. TIMBER DOG (Fig. 32)

FIG. 32 — *Timber Dog*

The timber dog is used to:

(1) Hold timber in place while framing the work or making the timber. See Fig. 17.

(2) Carry timber from place to place. Since a timber dog is used when carrying props, the mine worker must keep it in good condition and ready for SAFE use. Keep it sharpened correctly.

SAFE PRACTICES WHEN USING A TIMBER DOG

If a timber dog is not driven into the prop securely, a serious injury can happen to the workman. The prop can slip and crush or break feet or legs.

DRIVE THE TIMBER DOG INTO THE PROP SO THERE CAN BE NO CHANCE THAT IT CAN LET GO AND CAUSE INJURIES.

u. CANT HOOK (Fig. 33)

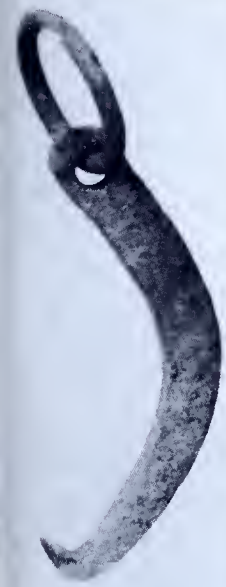

FIG. 33 — *Cant Hook*

The cant hook is used to assist in turning timber. Injuries can be caused by a carelessly placed cant hook.

Safe Practices When Using a Cant Hook

(1) Drive the cant-hook dog securely into the timber so there can be no chance for it to let go.

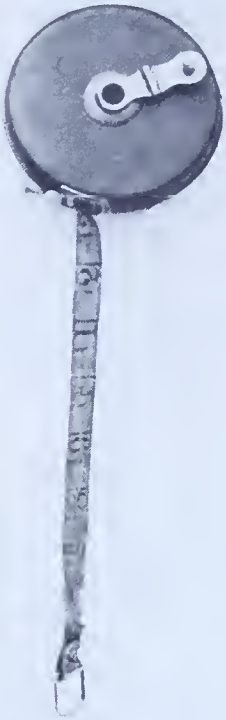

Fig. 34 — *Tape*

Fig. 35 — *Safety Lamp*

v. TAPE (Fig. 34)

The tape is used to:

(1) Measure timbers.

(2) Measure width of chamber.

(3) Measure width of gangway.

Safe Practices When Using a Tape

(1) Check the tape reading often enough to make sure the tape has not been stretched. If it has stretched, there is danger of making serious mistakes in measuring.

(2) A broken tape (a piece broken off the end) can cause trouble because of wrong measurements being taken.

(3) Walking on a tape or twisting it so that it gets kinks in it is poor practice and this abuse must be avoided for the sake of accuracy

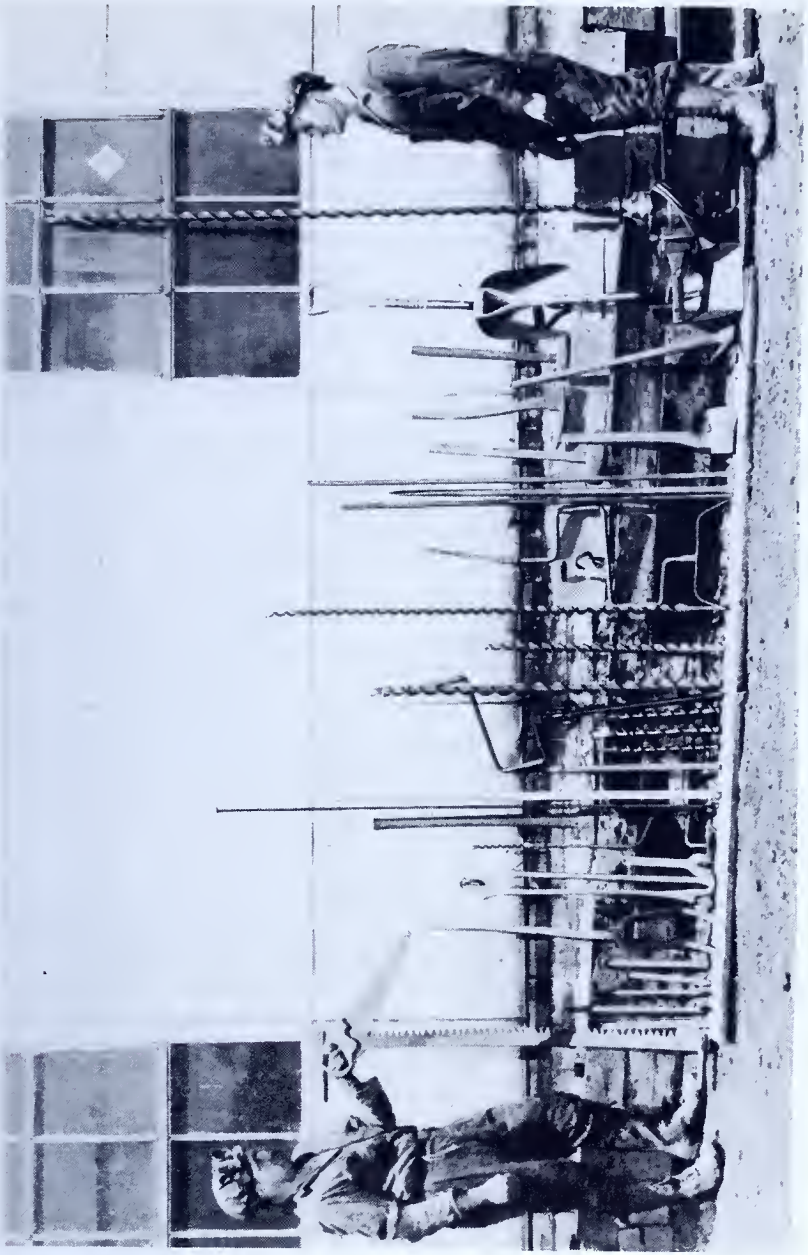

FIG. 36 — *Miner's Complete Tool Kit*

w. SAFETY LAMP (Fig. 35)

The safety lamp is used to test the working place and other mine locations for the presence of gas. The miner must get his safety lamp at the mine entrance as soon as he reports for work. (In non-gaseous mines a safety lamp is not used).

Safe Practices When Using a Safety Lamp

(1) Hold the flame safety lamp in a vertical (straight up) position.

(2) Use a flame one-half inch to one inch long.

(3) Raise the lamp slowly.

(4) Lower slowly (when gas is found).

(5) Hold the lamp at the high point to test for gas.

(6) If the flame goes out, return to the fresh air to re-light the lamp.

(7) Keep the safety lamp near the face until all workmen have left the working place.

(8) Remove the safety lamp, when the workmen leave the face.

DIVISION III

Responsibilities of a Miner and Laborer

1. General Discussion

There is always a reason for everything. Nothing "just happens", it is always caused. Read the previous sentences several times and think about how you or someone you know received an injury.

What was the cause?

Did the injury have to happen?

Did you or the others do anything to cause the injury?

Did you think before you acted?

Could the injury have been prevented?

The average person blames someone else for every unfortunate thing that he "walks into," and persons walk right into trouble every day because they do not think. It may be that they are too slow to think, or that they have never been taught to think. It appears that the great trouble with most persons is that they "hope" instead of "think." Do not blame others for your own poor judgment, for the exercise of judgment is what causes success or failure. Good judgment will prevent injuries; poor judgment causes injuries, and sometimes death.

WHAT IS JUDGMENT?

Judgment is often just guessing. Why should a miner guess how loose or how solid is the roof? Throw out this guessing stuff and use the safe, practical method. In every case, where the roof does not

sound solid, take it down or place enough props or timber to hold it. This is the only sensible thing to do.

Many persons claim that time is wasted in placing props and timbers. Miners who believed this and took a chance are not wasting any time now. They are the men who were killed or seriously injured because they did not take time, a few minutes, to protect themselves. They traded safety for death or painful and expensive injury. Ask any man who has been injured whether he saved any time by not playing safe. Of course, we cannot ask the dead men how much time they saved.

The record of mining accidents shows that more injuries have been caused by unsafe roof conditions than for any other reason. It appears that not sufficient attention has been given by the miners and laborers to the "looseness or tightness" of the roof.

There are only two kinds of roof:

1. GOOD: Solid and safe.
2. BAD: Loose and dangerous.

FIG. 37 — *A workman's protection*

WHO IS RESPONSIBLE FOR SAFE ROOF CONDITIONS?

The persons who can do the most about this roof condition are the miners and laborers. This means YOU! In the mines in the United States, during the sixty-year period, 1880 to 1940, more than 49,000 workmen were killed by falls of roof and coal. During the same period 400,000 workmen received non-fatal injuries from falls of roof and coal. With these facts on record, does it require much argument to convince us that miners, whose lives may depend upon their ability to detect a dangerous roof condition, should check on their so-called "judgment"?

KINDS OF ROOF

There are only two kinds of roof: GOOD AND BAD.

Men of mechanical experience, who are required to test metal by sound, know that there are only two kinds: GOOD AND BAD. A hollow or flaw in a link, bolt, or car wheel can be detected by the sound when it is tested. When it does not sound solid, it is thrown out. It is never called "pretty good" or "almost solid." Why should a miner, whose life is at stake, fool himself into believing that the roof is "good," "pretty good," or "not so bad," when the sound tells him that it is not SOLID? See DIVISION IV Item 1, b.

a. Since the beginning of mining in the United States, more than a million men have learned, too late, that there is no such thing as a roof that is "not so bad." Other miners are going to learn the same lesson in the same hard way, unless they hearken and turn away from the mistakes others have made. Some men learn from their own experience — and it is then too late.

FIG. 38 — *Testing and Examining Roof*

Many miners claim that because of their long experience, they cannot be fooled by the appearance of roof conditions. They are only fooling themselves by making this claim; the proof is against them. The years of experience of those persons killed and injured by roof falls in mines prove that experience is of little value if used to

determine whether the roof will hold until the car is loaded. It has been said that: "One good prop is worth forty years of experience".

BE INTELLIGENT

Miners and laborers are intelligent persons. The workmen in other industries are just as likely to be killed and injured due to unsafe practices. How many thousands of persons are killed and injured in automobile accidents in this country every year? It is not the fault of the automobile that people are injured, but rather because of the carelessness of the persons who drive automobiles, or because persons place themselves right in their way. So with the mining industry let it not be said that mine workers are more careless than other industrial workers. Take time to be SAFE!

THE MINER SERVES HIS FELLOWMEN

Mining is an industry, but also it may be classed as a profession, with respect to the miner. There will be a demand for coal as long as there is coal to be mined. Just as the automobile mechanic, the house carpenter, the shop worker, and many other tradesmen turn out commodities for the use and benefit of the nation at large, so does the coal miner contribute to the welfare of his fellowmen. He and other mechanics mentioned before can contribute their bit only so long as they are healthy, and sound in mind and body. Would it not be called a crime if someone deliberately pulled the roof down on a miner's head and caused his injury or death? Is the miner not guilty of negligence if he causes his own or another's injury or death?

PROTECT YOURSELF AND OTHERS

Call it playing safe, call it patriotism, call it what you will, no man has the right, at any time, to disobey the laws of nature or the laws of God. There are certain standards or regulations, which have been set up by State authorities, to be followed by mine workers, and others. They have been established for the protection of workers. Under the

law, mine workers are obliged to obey these standards or regulations. Men sometimes do as they please but if they are caught breaking the law, there is a penalty attached. This penalty may be a layoff or even a discharge and in some cases the offender is liable to prosecution. In either case the mine worker will injure his record. If miners and laborers pay attention to these regulations, injuries among mine workers will be reduced to the hazard of the industry. Any man is smart when he can do an honest day's work without injury to himself or others.

FIG. 39 — *Finishing the Shift Safely*

2. Safety at All Times

Experienced miners know that any injury which causes lost time for only a day will result in a loss of earnings and of coal production. Some workers are injured on their way to and from work. Most if not all such injuries can be prevented.

FIG. 40 — *Receiving their Pay at the Job*

The list of instructions which follow is given to aid the miner in looking out for his own safety. They are simple to understand and easy to carry out.

1. Miners and laborers should be careful at all times while on their way to or from work. Slippery places can cause bad falls. Watch the other fellow and walk — don't run.
2. Miners and laborers should travel to and from their work by way of the regular roads, paths, and entrances and in no case ramble around the mines where they have no business.
3. In no case travel through old workings or ride upon cars or other transportation equipment when it is prohibited.
4. Miners or laborers should never pass the checking-in station without the permission of the foreman in charge of their working place.

5. Mine workers must not take matches, lighters, or any other article which may cause fire, into a gassy mine. There is a good reason for this and the paragraph which follows explains why.

It is unlawful for any person, or persons, working in a mine or portion of a mine, which is worked by locked safety lamps or locked safety lamps and electric lamps, to carry into the mine matches, smoker's articles, or any other material or article which may cause fire, and to prevent such articles being carried into a dangerous mine or section thereof, the mine foreman, when he sees fit, shall cause a search of the men for such articles.

6. When checking in, if given any instructions about conditions in their working place or any other thing or matter that has to do with their safety or work, the miner and laborer should make sure that they understand the instructions and if such are not clear, ask the foreman to explain them so they are understood.

7. On arriving at their working places miners and laborers should not at first go nearer to the actual working face than 150 to 200 feet.

At this point they keep their tool box and other necessary supplies needed to carry on their work. This point, of course, must be kept in a safe condition at all times.

After the miner and laborer have put away their lunch box and whatever other supplies they may have brought with them, the miner is now ready to start the examination of his working place before beginning the day's work.

Leaving his laborer at the tool-box or other safe place, the miner, from this point on, should approach the working face slowly and cautiously making frequent tests for gas (with his flame safety lamp) of all the area and particularly the high points and, at the same time, he should examine the condition of the roof, ribs and face or any other thing that may endanger him or the laborer.

3. Anthracite Mine Law

Miners and laborers must not forget that certain laws have to be observed by the mine operator and the mine worker. None of these persons has any choice in the matter. While these mine laws are printed in a book form to be read and followed by all those concerned, it is thought that many of these laws should be pointed out in this pamphlet to help bring to the attention of the mine workers some of the more important things they must do to avoid injury to themselves and their fellow workers.

4. The Miner as the Law Sees Him

By an Act of May 9, 1889, a "Miner" is a person registered with the "Miner's Examining Board" as the holder of a certificate of competency and qualification to do the work of a miner. Also he is registered in the district in which he is employed.

ARTICLE XVIII (AS AMENDED JUNE 1, 1915, P.L. 712)

This Article gives the definition of what the law says a miner is. The definition follows:

"The term 'miner' means the person who cuts or blasts coal or rock at the face of a gangway, airway, breast, pillar, or other working place, also any person engaged at general work in a mine, and qualified to do the work of a miner." The entire Article XVIII will be found on Page 72, Anthracite Mining Laws of Pennsylvania, Harrisburg, Pa. 1941.

5. Anthracite Mining Laws of Pennsylvania, Article XI

The rules which follow also are to be observed by mine workers. They have been selected as important for the purpose of this pamphlet.

GENERAL RULES

"The following general rules shall be observed in every mine to which this act applies:"

Rule 7. Stations To Be Established

"A station or stations shall be established at the entrance to each mine or different parts of each mine, as the case may require, and a workman shall not pass beyond any such station until the mine or part of the mine beyond the same has been inspected and reported to be safe. It shall be the duty of the fire boss to remain at the danger station until relieved by some person, authorized by himself or the mine foreman, who shall stand guard until said mine or part of mine shall be reported safe, and he shall not let any person pass without permission from the fire boss."

Rule 14. Roofs and Side Must Be Properly Secured

"Any person having charge of a working place in any mine shall keep the roof and sides thereof properly secured by timber or otherwise so as to prevent such roof and sides from falling, and he shall not do any work or permit any work to be done under loose or dangerous material except for the purpose of securing the same."

Fig. 41 — *Placing Explosives in the Box*

Rule 26. Care of Explosives

"Gunpowder or any other explosive shall not be stored in a mine, and a workman shall not have at any one time in any one place, more than one keg or box containing twenty-five (25) pounds, unless more is necessary for a person to accomplish one day's work."

Rule 27. How Explosives Shall Be Kept

"Every person who has gunpowder or other explosive in a mine, shall keep it (See Fig. 41) in a wooden or metallic box securely locked, and such box shall be kept at least ten (10) feet from the tracks in all cases where room at such a distance is available."

Rule 28. Manner of Handling Explosives

"Whenever a workman shall open a box containing explosives or while in any manner handling the same, he shall first place his lamp not less than five (5) feet from such explosive and in such a position that the air current cannot convey sparks to it, and a workman shall not approach nearer than five (5) feet to an open box containing powder with a lamp, lighted pipe or any other thing containing fire."

Rule 29. Storage, etc., Must Be in Accordance With Special Rules By Manufacturers of Explosives

"When high explosives other than gunpowder are used in any mine the manner of storing, keeping, moving, charging and firing or in any manner using such explosives, shall be in accordance with special rules as furnished by the manufacturers of the same. The said rules shall be endorsed with his or their official signature and shall be approved by the owner, operator or superintendent of the mine in which such explosives are used."

The following procedure is recommended by a manufacturer of permissible explosives.

REGULATIONS for Storing, Keeping, Moving, Charging, Firing and Using High Explosives in Anthracite Mines of Pennsylvania.

STORING AND KEEPING

High explosives should be stored in a dry, clean, well-ventilated bullet- and fire-resisting building, safely located with reference to other buildings and public or private thoroughfares. Cases should be stacked in magazines top side up, the brand in front and in such a manner that the oldest stock will always be taken out first.

Blasting caps and electric blasting caps should never be stored in the same box with other high explosives unless the box is provided with a separate compartment for the exclusive storing of blasting caps and electric blasting caps, in which the separating partition should be constructed of hard wood not less than four inches in thickness and provided with a lock.

No matches or inflammable materials, such as oil, gasoline, paint, carbide, oily waste, etc., or metal or metal tools should ever be brought into a magazine containing high explosives. Floor should be kept clean, free from loose high explosives and no nail or bolt heads should be exposed. No artificial light other than an electric storage battery lantern or explosion proof electric flashlight should be permitted in a magazine. No fire or sparks should be allowed near a magazine and the ground around it should be kept clear of brush, leaves, grass, debris, or other inflammable material.

MOVING, TRANSPORTING, AND HANDLING

Blasting caps and electric blasting caps may be transported on the surface with other high explosives when packed and loaded in accordance with the amended Pennsylvania Regulations effective February 17, 1944.

Blasting caps and electric blasting caps should not be transported with high explosives in railroad cars, cages, or skips, nor should blasting caps, electric blasting caps or other high explosives be transported on the same vehicle, railroad car, wagon, motor-truck, cage or skip with metal, metal tools, matches or other inflammable substance.

DESCRIPTION OF PRIMING METHODS

PRIMING WITH BLASTING CAP AND FUSE

When blasting caps are used, the proper length of the fuse should be cut from the roll and the blasting cap crimped to the fresh cut end of the fuse with a cap crimper, not with a knife or the teeth. Be sure that the fuse is cut square across and that the freshly cut end is pushed gently against the charge in the blasting cap. The crimp in the blasting cap should be made near the end which the fuse enters. In wet work, a waterproof crimp or an approved cap sealing compound made for the purpose should be placed over the point between the fuse and blasting cap.

(1) Punch a hole with the wooden powder punch in either the end or side of the cartridge. Whether you punch down the middle or in through the side, the hole should end up midway between the walls of the cartridge so that the detonator is centered in the explosive. In this way, the cap is protected from impact, pinching or abrasion. (2) Insert the blasting cap and fasten the fuse securely to the dynamite cartridge with twine to prevent the cap and fuse being pulled out of the dynamite cartridge, business end toward charge.

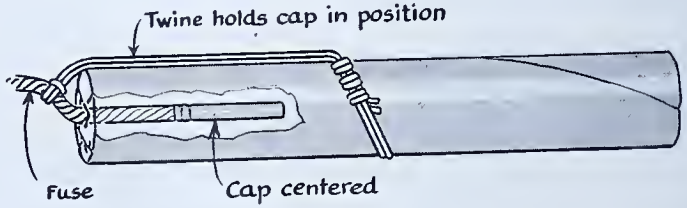

FIG. 42 — *Blasting Cap and Fuse Inserted in End of Cartridge*

PRIMING WITH AN ELECTRIC BLASTING CAP OR DELAY ELECTRIC BLASTING CAP

When electric blasting caps or delay electric blasting caps are used, punch a hole through the diameter of the cartridge at or below its middle, and also into the center of one end. Push the cap all the way through the middle hole with about 10 inches of wire drawn through after it. Then insert the cap in the end of the cartridge and pull the wires back to take up the slack and eliminate kinks and hitches.

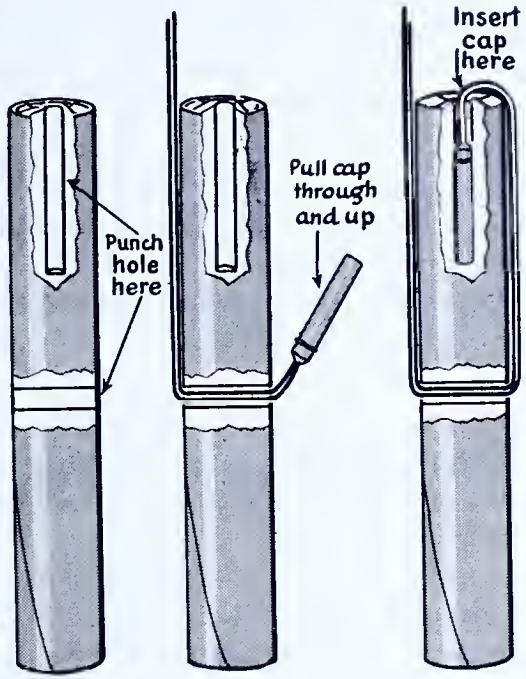

FIG. 43 — *Electric Blasting Caps*

PRIMING WITH A DELAY ELECTRIC IGNITER

When delay electric igniters are used, punch a slanting hole in the side of the cartridge and insert the capped end of the delay device in this hole, having the fuse element lying along the outside of the cartridge. Near the end of the cartridge securely fasten the delay electric device to the cartridge with the firing head and vent hole not in contact with the cartridge of explosives. This primer cartridge should be the last explosive cartridge to go into the bore hole. In order to protect the firing head from injury, push the primer cartridge into the bore hole along with a cartridge of tamping following it and with the firing head and vent hole alongside of the cartridge of tamping.

CHARGING

After the hole is bored and cleaned out, load the required number of cartridges and press them firmly into place with a wooden tamping stick. Avoid open spaces or foreign matter between cartridges. The primer especially must be loaded carefully.

STEMMING AND TAMPING

Bore holes should be stemmed with damp clay, moist sand, rock dust or other approved material, but not with rock chips. When tamping the bore hole, care must be taken not to kink or injure the fuse or electric blasting cap wires.

FIRING

When firing electrically, be sure that all wire ends which are to be connected are scraped bright and clean, and that the joints and any other bared portions of wire are insulated or that they do not touch other joints, wire, rails, pipes, ground or other possible source of electric current or path of electric leakage. The leading wires should be kept in good condition and should never be connected to the blasting machine or firing battery until immediately before firing and until everyone is in a safe place. The leading wires should never come in contact with any source of electric current other than the blasting machine or firing battery.

When firing electrically, sufficient time (local rule on length of period) should be allowed before returning to a misfire.

When firing with fuse and blasting caps, the fuse should be cut long enough for the end to extend well out of the mouth of the bore hole when the primer is in place and long enough to give plenty of time for the person firing the shot to get to a safe place before the charge explodes. Before lighting the fuse or setting off any blast, sufficient warnings should be given to persons in the vicinity.

When firing with fuse and blasting caps, a safe time, 12 hours or more, should be allowed before returning to a misfire.

The tamping should not be withdrawn from a charge which has misfired. Another hole should be drilled at a safe distance away but with a view of moving the burden and exploding missed charge. After exploding such new charge, great care should be taken to recover any unexploded explosives from the misfired charge.

RULE 30. MANNER OF CHARGING HOLES FOR BLASTING

"In charging holes for blasting in slate or rock in any mine, no iron or steel-pointed needle shall be used, and a tight cartridge shall not be rammed into a hole in coal, slate or rock with an iron or steel tamping bar, unless the end of the tamping bar is tipped with at least six (6) inches of copper or other soft metal."

RULE 31. WHEN A CHARGE MISSES FIRE

"A charge of powder or any other explosive in slate or rock which has missed fire shall not be withdrawn or the hole reopened."

RULE 32. MUST NOT SHORTEN THE MATCH, ETC.

"A miner or other person who is about to explode a blast by the use of patent or other squibs or matches, shall not shorten the match, nor saturate it with mineral oil, nor turn it down when placed in the hole, nor ignite it except at its extreme end, nor do anything tending to shorten the time the match will burn."

RULE 33. BEFORE FIRING BLAST ALL PERSONS MUST BE NOTIFIED

"When a workman is about to fire a blast he shall be careful to notify all persons who may be in danger therefrom and shall give sufficient alarm before and after igniting the match so that any person or persons who may be approaching shall be warned of the danger."

RULE 34. MUST EXAMINE AFTER EACH BLAST

"Before commencing work and also after the firing of every blast, he miner working a breast or any other place in a mine, shall enter

such breast or place to examine and ascertain its condition, and his laborer or assistant shall not go to the face of such breast until the miner has examined the same and found it to be safe."

RULE 35. BLASTER MUST BE QUALIFIED TO DO SUCH WORK

"No person shall be employed to blast coal or rock unless the mine foreman is satisfied that such person is qualified, by experience and judgment, to perform the work with ordinary safety."

RULE 37. REMOVAL OF GAS

"An accumulation of gas in mines shall not be removed by brushing where it is practicable to remove it by brattice."

RULE 38. IGNITED GAS MUST BE EXTINGUISHED

"When gas is ignited by blast or otherwise, the person igniting the same shall immediately extinguish it, if possible, and notify the mine foreman or his assistant of the fact, and workmen must see that no gas blowers are left burning upon leaving their working places."

RULE 55. CUTTING OF PROPS AND TIMBERS PROHIBITED

"No person or persons working in any coal mine or colliery shall cut any props or timbers while the same are in position to support the roof or sides. When it becomes necessary to remove any of the said props or timbers for the purpose of mining coal that may be supported by the same, to dislodge any of the said props or timbers, it must be done by blasting."

SECTION 2. ARTICLE XI, ANTHRACITE MINE LAWS

"Every workman in want of props, ties, rails or timbers shall notify the mine foreman or his assistant of the fact at least one day in advance, giving the length of the props or timber required, and in case of danger from loose roof or sides, he shall not continue to cut or load coal until the said props and timber have been properly furnished and the place made secure."

DIVISION IV

The Work a Miner and Laborer Does

1. Examine the Working Place

a. TEST FOR GAS

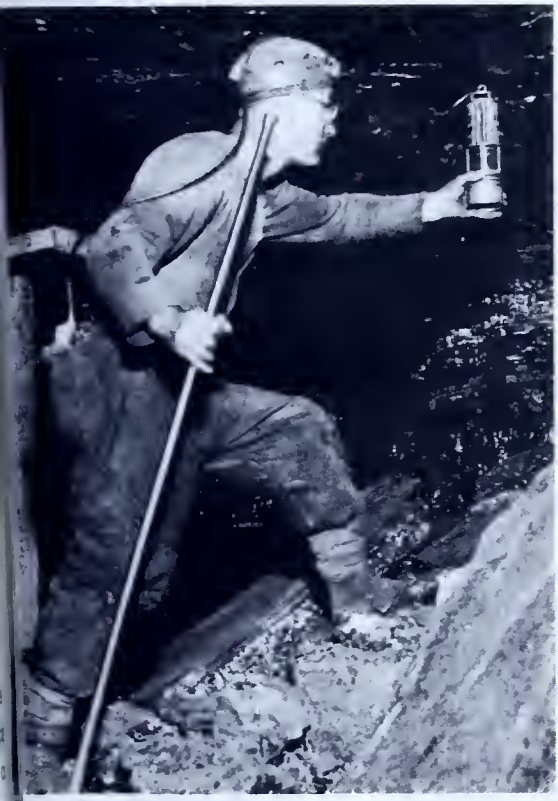

FIG. 44 — *Testing for Gas*

Methane (also known as "Marsh Gas") is a gas commonly found in coal mines. It is colorless, odorless, tasteless, and it is not poisonous. It is lighter in weight than air and when mixed with air in the correct amount it becomes explosive.

If a certain amount of air weighs one pound, the same volume of gas will weigh just a little more than one-half pound. Written in figures this comparison in weight is as 1.00 is to .555. The chemical symbol of methane is CH_4, which means that the gas contains one part of Carbon to four parts of Hydrogen.

The gas may come from the pores in the coal, from blowers or feeders, reservoirs, or from overlying or underlying layers of coal and rock. The gas may come out in a steady flow or it may come in sudden outbursts. Because it is lighter than air it rises and is usually found near the roof or in high points.

Methane gas explodes with a force of 125 pounds per square inch at its maximum explosive point and the force travels 23 feet per second. An average man in the path of such an explosion would get a jolt about equal to 54 tons going 15 miles per hour. For this reason it is absolutely necessary that all gas be removed before workmen are allowed to do any work in any work place.

As soon as the miner and laborer arrive at the work place, the miner makes a test to determine if gas is present. The construction and operation of a flame safety lamp has been explained in DIVISION II, 2 — w.

Instructions for using a flame safety lamp to test for the presence of gas:

PROCEDURE

(1) Hold the lamp in a vertical position.
(2) Raise the lamp slowly.
(3) If gas is found, lower the lamp slowly. The flame should be from ½″ to 1″ long. This length of flame will give more light to see as the miner approaches the area he desires to examine. This type of flame will reveal the presence of gas promptly. As the gas enters the lamp it will expand due to the heat and combine with the lamp flame thus making the flame longer (this is called elongation of the flame). This action of the flame indicates the presence of gas and can be readily observed by the person making the test. It has been found by tests that this length of flame is the safest to use to detect the presence of gas.
(4) To test for a cap reduce the size of the flame (FIG. 45) to a small speck of yellow, about ⅛″ in height.
(5) Test again to detect for a gas cap in the mine atmosphere.

b. TEST THE ROOF, THE RIBS, AND THE FACE

Fig. 45 — *Height of Flame*

The purpose of testing the roof, ribs, and face is to determine whether or not it is safe to work under them. The test is made with a steel testing bar, (Fig. 38) and the length of the bar depends upon the height of the seam. This length should be about 12″ shorter than the height of the seam so that the bar can be held at right angles to the roof.

Procedure

(1) Stand in a position that will allow the bare fingers of one hand to be placed on the roof or surface to be tested. See Fig. 38.

(2) Hold the testing bar in the other hand and tap lightly the roof or surface to be tested.

When making the examination of the roof, ribs, and face, the senses of sight, hearing, and feeling tell the miner about the condition of these surfaces. The miner must SEE, HEAR, and FEEL.

With the bare fingers the miner can feel any vibration as he taps the roof lightly. He can see any cracks, fissures, bells, slips, etc. He can hear whether the roof sounds drummy or solid.

Where the height of the coal seam is so high that the bare fingers cannot be placed against the roof, then a tamping stick should be held in one hand and the end placed against the roof so that the vibrations can be felt when the roof is tapped with the testing bar.

(3) Test the roof of the working place from rib to rib for a distance back from the face that will insure safety. RULE 34. ARTICLE XII, ANTHRACITE MINE LAW — "Before commencing work and also after the firing of every blast, the miner working a breast or any other place in a mine, shall enter such breast or place to examine and ascertain its condition, and his laborer or assistant shall

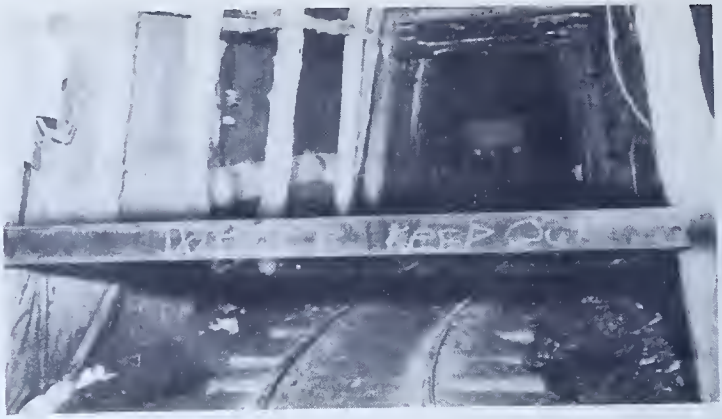

FIG. 46 — *Guard the Working Place*

not go to the face of such breast or place until the miner has examined the same and found it to be safe."

(4) Pull down or secure loose roof, ribs, or face.

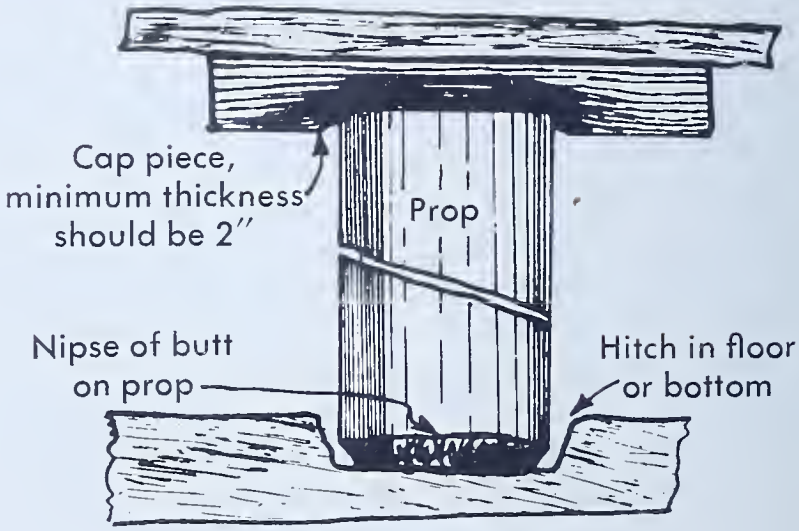

FIG. 47 — *Cut Hitch in Floor*

This work must be done before proceeding with the other regular work.

RULE 14. ARTICLE XII, ANTHRACITE MINE LAW — Any person having charge of a working place in any mine shall keep the roof and sides thereof properly secured by timber or otherwise so as to prevent such roof and sides from falling, and he shall not do any work or permit any work to be done under loose or dangerous material except for the purpose of securing the same.

If a dangerous condition is found, gas or dangerous roof, fence off working place entrances and call an official.

The foreman should supervise the removal of the gas, and the correcting of the dangerous roof condition.

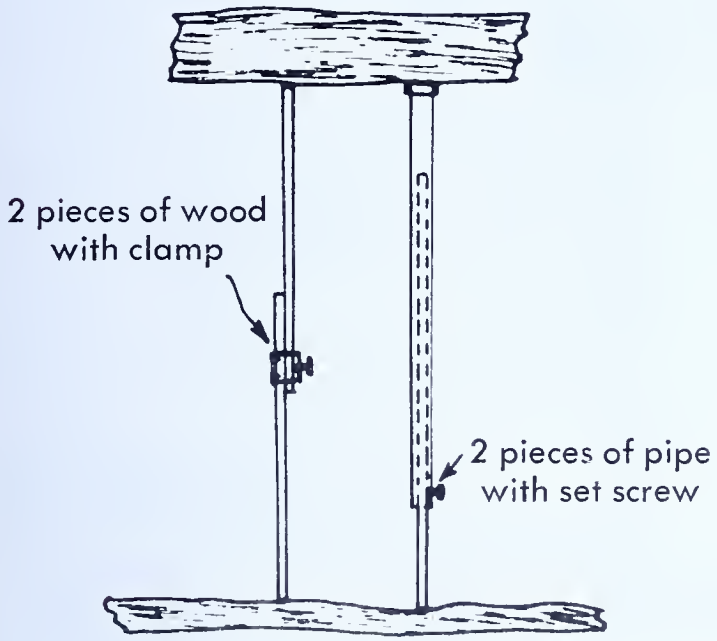

FIG. 48 — *Measure for Length of Prop*

c. GO AHEAD WITH THE JOB

(1) Notify the laborer or laborers that it is safe to go ahead with the work.

(2) Proceed with the work and at the same time watch carefully to see that no unsafe conditions develop:

(a) Loose prop

(b) New cracks in roof or ribs

(c) Pockets of mine gas

2. Set Props and Timbers

a. TO SECURE ROOF

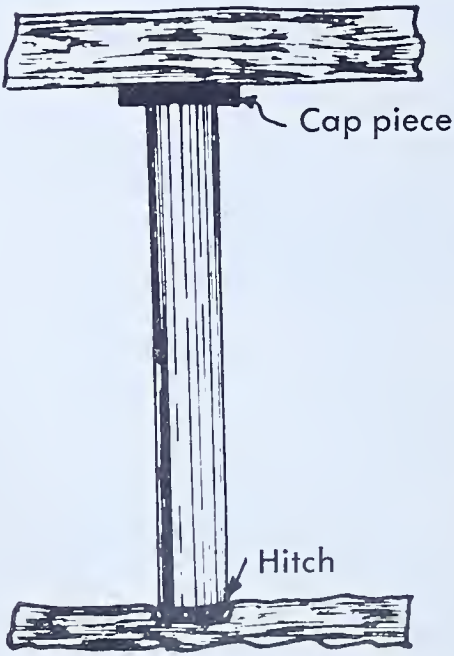

FIG. 49 — *Place Prop and Cap Piece*

(1) Decide where the first prop should be located.

(2) Cut hitch in the floor to receive prop.

(3) Measure for length of prop.

(4) Decide size and length of cap piece.

(5) Trim prop to correctly fit hitches.

(6) Place prop and cap piece.

Place props not more than six feet apart and closer if conditions require it.

Cross timbers or double timber (Fig. 51) should be placed at intervals of not more than six feet apart (closer where condi-

tions warrant it) and they should be placed to within at least six feet from the face. Cross timbers or collars are shown at *a,a,a.*

The legs of the cross timber sets should be hitched (*b,b,b,*) in the bottom. Wedges should be placed (*c,c,c,*) over the collar *d* directly over the legs. The collar and legs should be braced (*e,e,e,e*) one to another for additional support and safety.

b. TO SECURE RIBS

PROCEDURE

(1) Measure for lengths of props or cross timbers to secure ribs, (Fig. 51) at *f,f.*

(2) Cut props or cross timbers to length.

(3) Place lagging or forepoles between props or cross timber legs and ribs as shown at *h,h,h.* (Fig. 51)

In caved or squeezed ground, cross timbers are used, or in pitching seams where the coal is "Free", forepoles (Fig. 51 at *k,k,k*) should be placed in advance of the collar or the cross timber set to protect the miner and laborer while they are making room for the next set of timber.

For advancing the caved ground face, the rib sides of the face must be extended first to provide greater safety.

3. Drill for Blasting

Holes must be drilled in the coal face deep enough to place the explosives to blast loose the coal.

A hand drill, an electric drill, or a compressed air jack hammer can be used to drill the holes. The holes must be drilled large enough to allow the explosives to be pushed into place easily.

FIG. 50 — *Typical Position of Props*

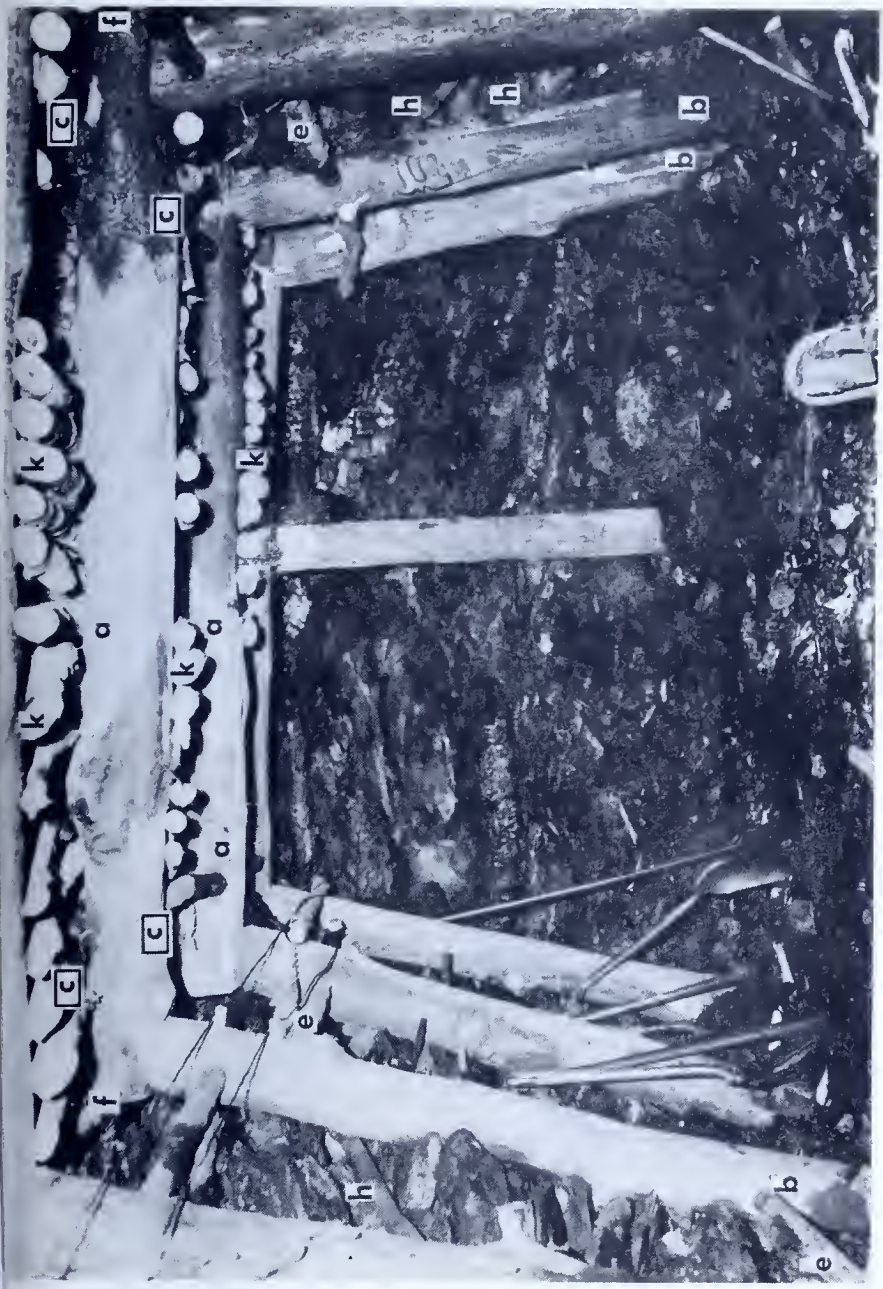

FIG. 51 — *Cross Timbers and Legs*

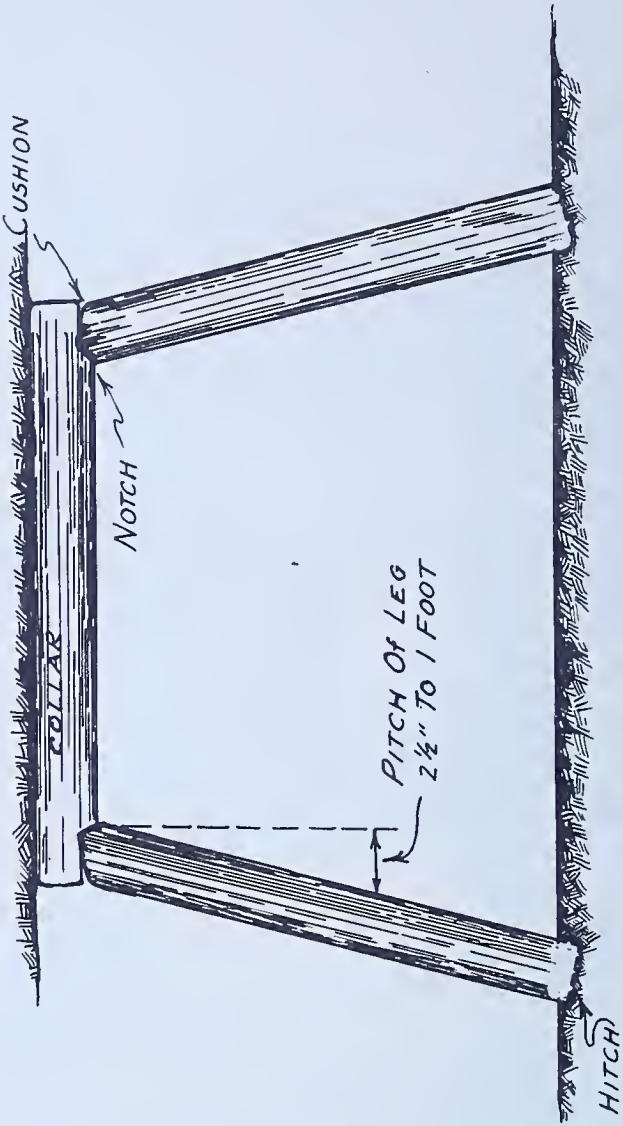

FIG. 52 — *Collar and Two Legs. (Note Hitch in Floor)*

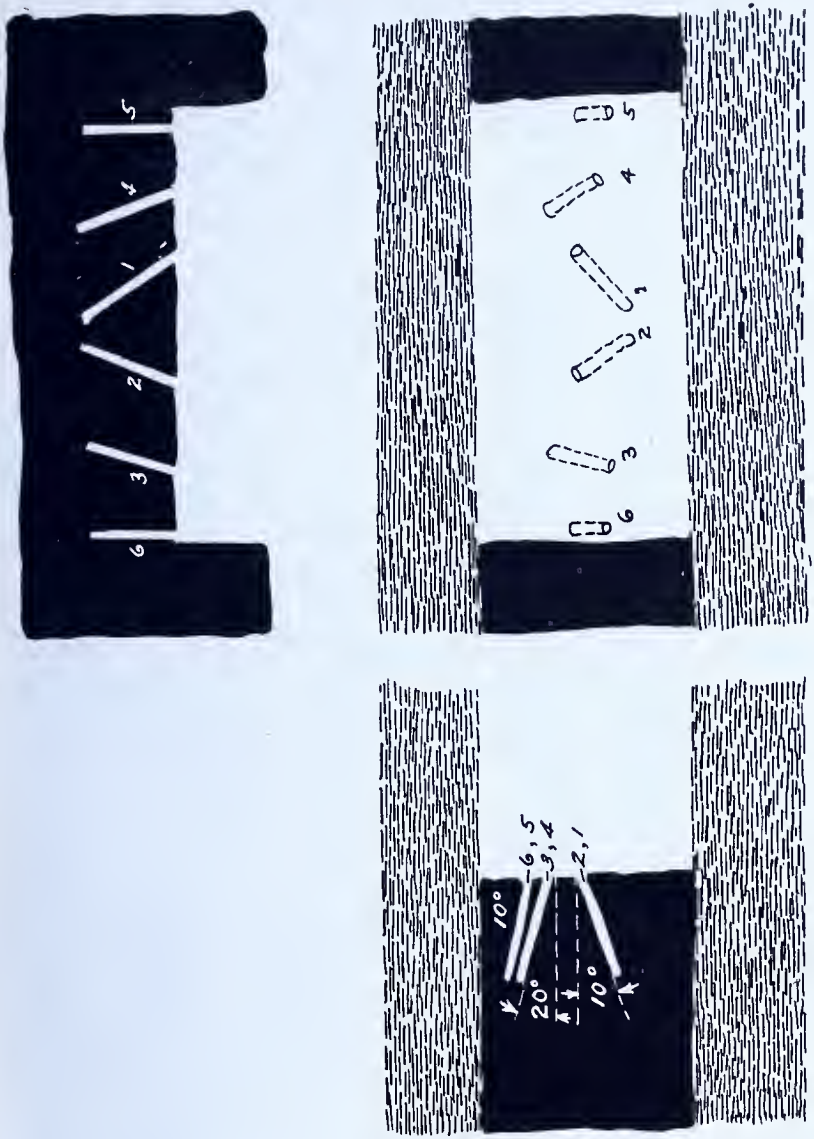

FIG. 53 — *Angles of Drilled Holes*

FIG. 54.—*Drilling Hole for Blasting*

RULE 30, ARTICLE XII, ANTHRACITE MINING LAW — "In charging holes for blasting in slate or rock in any mine, no iron or steel-pointed needle shall be used, and a tight cartridge shall not be rammed into a hole in coal, slate or rock with an iron or steel tamping bar, unless the end of the tamping bar is tipped with at least six (6) inches of copper or other soft metal."

PROCEDURE

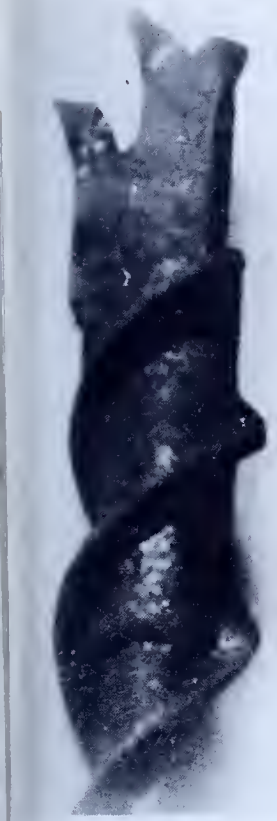

FIG. 55 — *Cutter Bit End*

(1) Select a cutter bit of the correct size.

(2) Check the cutter bit to make sure it will cut to the right size.

All holes shall be drilled to gauge. The diameter of the drilled hole is very important and the gauge of the cutter bit must be checked frequently. The various powder cartridges make it necessary to select a cutter bit that is the correct gauge (size).

If the hole is too tight for the cartridge to be inserted easily, it may stick and block the hole before it can be pushed to the back of the hole. When this happens there is not enough depth in the hole for sufficient tamping to confine the explosive force to the hole. This results in a blown-out shot which causes more smoke and dangerous fumes than would be the case if the shot was exploded correctly, and if methane gas had accumulated it would be ignited by this longer burning flame.

Also, there is danger when powder

cartridges stick in tight holes that too much pressure will be applied when the miner attempts to ram the charge to the back of the hole, and the detonator will be discharged.

(3) Fasten the cutter bit securely to the drilling rod.

(4) Drill the hole to the correct depth (according to conditions).

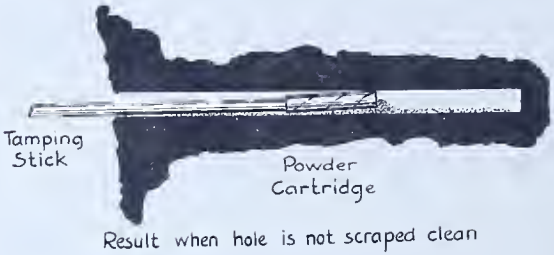

FIG. 56 — *Result When Hole Is Not Scraped Clean*

The correct depth of the hole can be marked on the shank end of the cutter bit, or the depth of the hole can be measured with the wooden tamping stick when the cutter bit is withdrawn.

(5) When the hole has been drilled to the correct depth, remove the cutter bit.

(6) Use the scraper or blow pipe and remove all cuttings from the drilled hole; make sure the hole is clean. See Fig. 56.

Dirt or dust which is left in the hole will almost surely cause the powder cartridge to stick when it is inserted.

4. Charge Hole With Powder

a. PREPARE CHARGE

The miner is responsible for the preparation, charging, and firing of all blasts. He must follow carefully and exactly all rules which are given for his protection and for the protection of others.

Before the miner opens a box which contains explosives he shall place any open light at least five feet from the box, and on the return-air side.

RULE 28. ARTICLE XII, ANTHRACITE MINING LAW—"Whenever a workman shall open a box containing explosive or while in any

manner handling the same, he shall first place his lamp not less than five (5) feet from such explosive and in such a position that the air current cannot convey sparks to it, and a workman shall not approach nearer than five (5) feet to an open box containing powder with a lamp, lighted pipe or any other thing containing fire."

PROCEDURE

(1) A wooden mallet and a wooden wedge must be used to open a box of explosives.

FIG. 57 — *Making the Hole*

(2) Use a wooden primer punch (Fig. 31) and make a hole for the detonator in the powder cartridge (stick of powder).

(3) Cut off all electric power before taking the cartridge and detonator to the face.

(4) Fasten the detonator to the primer cartridge.

The detonator shall be fastened to and imbedded in the primer cartridge lengthwise of the cartridge. It must not be inserted at an angle.

The priming operation should be done at the face and just as needed for placing in the hole.

b. PLACE CHARGE

(1) Place all of the cartridges in the drilled hole.

(2) Place the cartridge, containing the detonator, last.

Point the bullet end of the detonator toward the other cartridges.

(3) Use a wooden tamping stick and push the entire charge to back of the hole.

RULE 30. ARTICLE XII, ANTHRACITE MINING LAWS — Manner of charging holes for blasting. "In charging holes for blasting in slate or rock in any mine, no iron or steel-pointed needle shall be used, and a tight cartridge shall not be rammed into a hole in coal, slate or rock with an iron or steel tamping bar, unless the end of the tamping bar is tipped with at least six (6) inches of copper or other soft metal."

NOTE: Use a copper-tipped drill to push charges of black powder

FIG. 58 — *Tamping the Charge*

to the back of the hole. See RULE 30, ARTICLE XII. Care must be taken not to break or destroy the insulation on leg wires when the charges of explosives are placed in the holes.

c. TAMP CHARGE

The hole has been charged with cartridges of explosive, the primer has been placed against the cartridges, and the entire charge has been pushed to the back of the hole.

Now the charge has to be tamped and non-combustible material must be tamped into the hole. Every possible precaution must be used when tamping.

Use wooden tamping bars only, when high explosives are used. See Figs. 42, 43. The following steps are taken when tamping:

PROCEDURE

(1) Place the wooden tamping stick in the hole and against the charge.

(2) Press firmly, use a wooden tamping stick to push the tamping (or stemming) against the charge.

(3) Tamp non-combustible material with the wooden tamping bar.

(4) Continue to place stemming and tamp until the hole is filled firmly to the mouth.

NOTE: Use a copper-tipped drill to push tamping against charges of black powder, after copper needle has been inserted. The hole shall be filled to the mouth with tamping. See RULE 30, ARTICLE XII.

5. Fire the Blast

a. TEST WORKING PLACE FOR PRESENCE OF GAS

Make this test as instructed in this DIVISION, Item 1, a. Failure to do this could result in the gas becoming ignited when the blast is fired.

RULE 11, ARTICLE XII, ANTHRACITE MINING LAW — "No blast shall be fired in any mine where locked safety lamps are used except by permission of the mine foreman or his assistants, and before

FIG. 59 — *Placing Charge of Black Powder*

a blast is fired, the person in charge must examine the place and adjoining places and satisfy himself that it is safe to fire such blast before such permission is given."

FIG. 60 — *Tamping Charge of Black Powder*

FIG. 61 — *Testing for Gas*

b. CHECK FIRING LINE FOR CORRECT CONDITION

The ends of the firing line must be shunted as shown in (Fig. 8).

If a portable firing line is used (a line wrapped around a reel) the miner must check the battery ends and see that they are twisted together to cause a short circuit in the line. Check this hook-up:-

(1) At the shunt box.

(2) At the battery end of the firing line.

The miner must see that insulators on which to hang the portable firing line are installed in the correct position. The miner hangs the portable firing line on these insulators as he goes back from the face.

FIG. 62 — *Connecting Lead Wires to Leg Wires*

If a permanent firing line is used, the wires should be hung on insulators with a break in the line at a point 50 to 75 feet from the face. At this point the ends of the wire must be twisted together to cause a short circuit (shunted).

The battery ends of the permanent firing line also must be short circuited (shunted).

c. CONNECT THE LEAD WIRES AT THE FACE

The shunt on electric detonators shall be maintained until the miner is ready to connect the leg wires to the lead wires at the face.

After removing the shunt from the leg wires on the detonators, do not allow the wires to touch the bottom, the ribs, car rails, shaker pans, cables, pipe lines, mine cars or any other object.

FIG. 63 — *Lead Wires Connected to Leg Wires*

d. NOTIFY ALL PERSONS THAT A BLAST IS TO BE FIRED

RULE 33, ARTICLE XII, ANTHRACITE MINING LAWS: "When a workman is about to fire a blast he shall be careful to notify all persons who may be in danger therefrom, and shall give sufficient alarm before and after igniting the match so that any person or persons who may be approaching shall be warned of the danger."

(1) When a blast is about to be fired in a working place all entrances to the working place and places nearby into which the blast might break its way must be guarded.

(2) The miner must give warning to all persons, who are near enough to get injured, that a blast is about to be fired.

(3) The miner must receive a prompt answer and he must make sure that all persons are in a safe place.

FIG. 64 — *F-I-I-I-R-E! F-I-I-I-R-E!!*

(4) Blast shall not be fired until a warning has been given and an answer received.

Never take chances when BLASTING.

Make sure everyone has received a WARNING.

e. FIRE THE BLAST

The Anthracite Mining Law states that when firing electrically no source of power shall be used other than a blasting machine or a firing battery.

The miner who is to fire the blast should be the last person to leave the face.

The miner must be sure that all safety shunts (breaks) are reduced before connecting the firing line to the battery. See Fig. 66.

6. Re-examine the Working Place

a. TEST FOR GAS

Make the test for gas as explained in this DIVISION, Item 1, a.

b. TEST THE ROOF, RIBS, AND FACE

Make the test on roof, ribs, and face as explained in this DIVISION, Item 1, b.

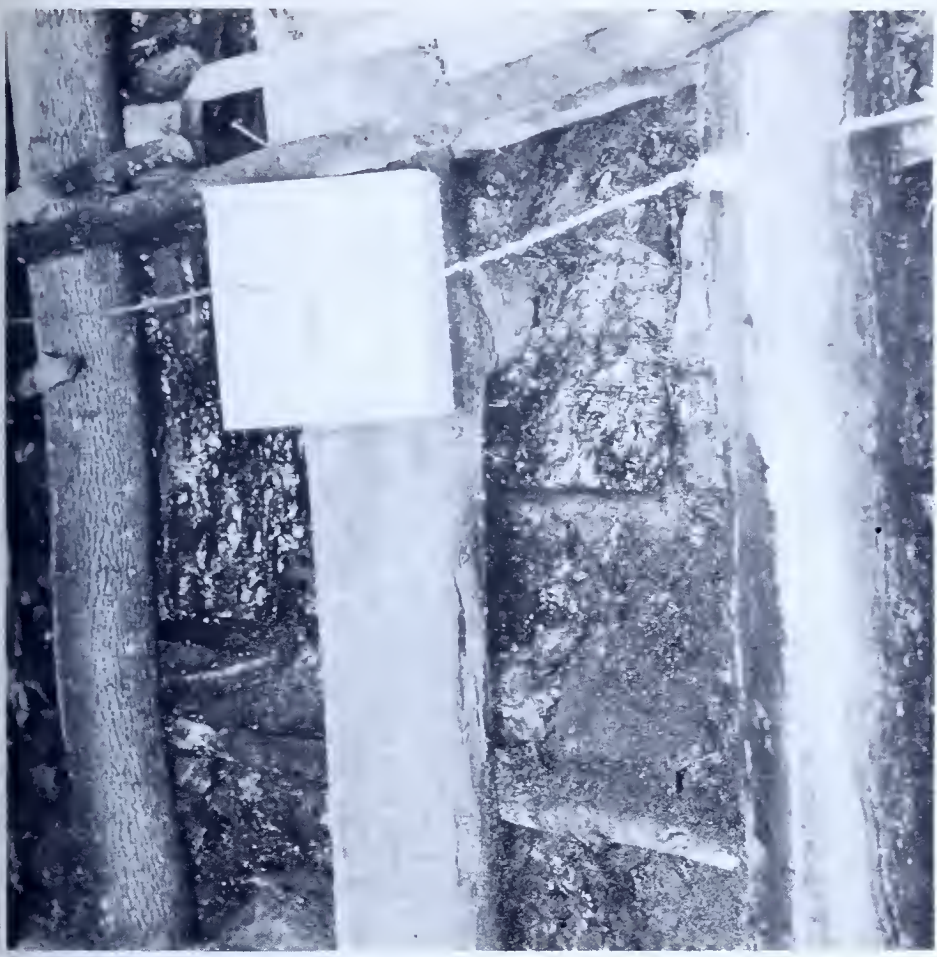

FIG. 65 — *Shunt Box Wires Shunted*

c. RE-STAND PROPS AND TIMBERS, IF NECESSARY

Props and timbers may become loosened when a blast is fired. The props and timbers must be inspected and if any are found loose or dislodged they must be replaced securely before workmen proceed to load coal.

7. Load Coal

a. WITH SHOVEL, BY HAND

The coal or rock is shoveled directly into the mine car. The point a which this shoveling is done is generally known as a car place.

FIG. 66 — *Shunt Box Wires Connected*

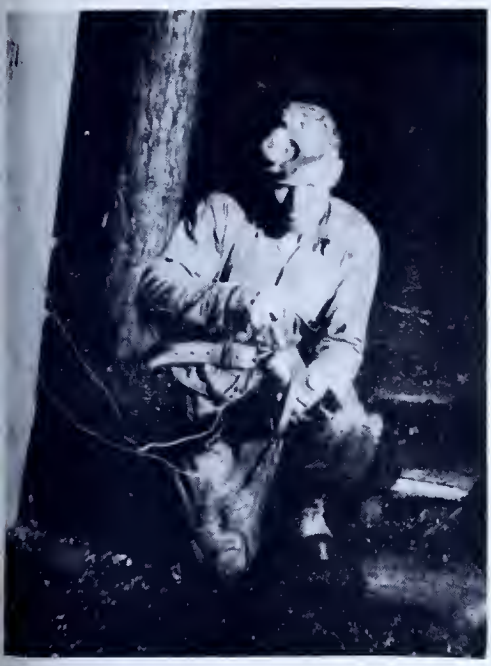

FIG. 67 — *Firing the Blast with a Twist Type Unit*

b. WITH DRAG LINE, MECHANICAL

A mechanical loader of this kind is commonly known as a scoop loader, a scraper, or a drag line loader.

The scraper loader is somewhat similar in shape to the old fashioned snow plow. It is reversed in its action when loading coal, that is, the wide end goes foremost and in this way gathers the coal toward the center. It is made of steel plates and the bottom edges of the side plates are curved inwardly and so scrape up the coal.

It is attached by ropes to a hoist located in a cross-cut on the gangway. The hoist has two drums, one of which turns to haul the empty scraper to the far end of the cut. The other drum turns to haul the scraper forward and so brings the coal to the mine cars on the gangway.

c. WITH A SHAKER CHUTE

A shaker chute is a steel trough built in sections. Each section is about ten feet long and twelve to fifteen inches wide. The chute is connected with, and operated by, a series of gears and irregular wheels which gives a back and forth motion to the chute.

As the coal is shoveled into the chute, the chute goes back and forth and so joggles the coal towards the cars on the gangway.

d. WITH A DUCK-BILL, MECHANICAL

A duck-bill is a device attached to the face end of the shaker. The use of a duck-bill cuts down a large amount of hand shoveling.

FIG. 68 — *Loading Coal with a Shovel*

e. FROM A DRAW CHUTE (PITCH MINING)

A draw chute is used in pitch mining. The method is similar to using an outside storage bin. The chute board is opened and the coal runs by gravity into the mine cars.

FIG. 69 — *Loading Coal with a Drag Line*

FIG. 70 — *Shaker Chute in Use*

FIG. 71 — *Duck-Bill Loader*

8. Assist in Moving Cars

a. PLACE HEADBLOCK

Cars must never be allowed to stand without having a headblock placed to prevent the car from running away. Of course, the headblock should be placed ahead of the wheels on the "down-grade" end of the car.

FIG. 72 — *Headblock in Position*

9. Lay Track

a. EXTEND TRACK

Track must be extended from time to time. There must be no delay

in extending track. All possible preparations should be made ahead of time so the track will be laid as soon as the coal is ready to be loaded.

FIG. 73 — *A Clevis Block (one rail)*

Track must be laid promptly and as soon as space has been cleared ahead. This procedure will allow the mine cars to be placed at a convenient location for loading.

The track should be aligned, ballasted, and bonded correctly to provide smooth and even transportation. The procedure for laying track follows:

PROCEDURE

(1) Level the bottom in line with track that has been laid before.

(2) Lay and place ties. Ties should be spaced not more than two (2) feet apart.

(3) Lay the extension rails on the ties.

(4) Attach fish plates to extension rails and to the rails that are already in place.

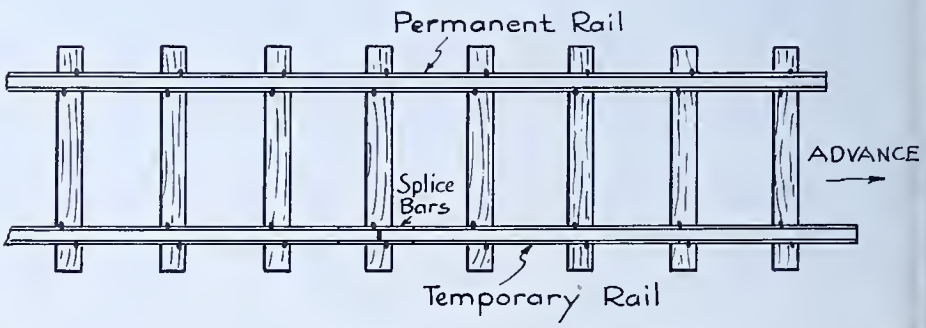

FIG. 74 — *Ballast and Alignment*

(5) Spike one rail to the ties.

(6) Remove short rail from track already laid.

(7) Place track gauge across rails and spike second rail to ties.

FIG. 75 — *Brattice Erected Properly*

(8) Replace short rail in place to make rails of even length.

(9) Ballast track to grade.

10. Erect Brattice

a. MECHANICAL MINING

Canvas or boards can be used to make brattice. In gaseous mines, the brattice should be made of boards. Brattice is constructed from the face cross-cut to within six or eight feet from the working face.

The purpose of brattice is to conduct the ventilation to the working face. This means that the boards must be joined closely and that all irregular openings must be closed tightly, to prevent the air current from leaking through. This applies to both hand and mechanical mining. With very few exceptions the brattice should be erected on the intake side. Boards top and bottom canvas brattice.

11. Handle Powder

a. GET ORDER FROM PROPER OFFICIAL

When a miner needs to use powder he must report to the official in charge and state the reason for such use. The official will provide the miner with a signed order for the amount of powder needed.

b. TAKE ORDER TO POWDER HOUSE

The miner must present this order to the person in charge of the powder magazine.

c. GET POWDER FROM POWDER HOUSE

The person in charge of the powder magazine will give the miner presenting the order, the amount of powder written on that order.

d. TAKE POWDER TO WORKING PLACE

Powder must be transported into the mine carefully. The miner must take the powder to his work place and put it safely in his miner's explosive box.

FIG. 76 — *Placing Explosives in the Box*

The explosive box must be locked and placed in a safe place. RULE 27, ARTICLE XII, ANTHRACITE MINE LAWS: "Every person who has gunpowder or other explosive in a mine, shall keep it in a wooden or metallic box securely locked, and such box shall be kept at least ten (10) feet from the tracks in all cases where room at such a distance is available."

DIVISION V

Brief History of Pennsylvania Coal

(Condensed from a paper by Professor Wm. R. Chedsey, former Head, Mining Engineering Department, The Pennsylvania State College, State College, Pa.)

The first written mention of coal in Pennsylvania is credited to Col. James Burd who observed and burned coal in 1759 near what is now Brownsville. Capt. Thomas Hutchins, in 1760, reported coal as being mined on the opposite side of the Monongahela River from Fort Pitt. In 1762 anthracite was discovered near Wilkes-Barre by a group of Connecticut pioneers. (**See Footnote*) Although considerable coal was mined at an early date in both the western Pennsylvania and the anthracite regions, the first organized effort at mining and selling coal was made in the anthracite region, due, no doubt, to the necessity of solving the problem of how to burn this low volatile form of coal which was so hard to kindle. A company began the mining of anthracite at Plymouth in 1807, this being the first record of quantitative coal production.

The economic development of the anthracite industry dates back to 1820 when two separate companies, the Lehigh Navigation Company and the Lehigh Coal Mining Company, merged under the title of Lehigh Navigation and Coal Company. They were incorporated in 1821 as

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(Editor's Note: Necho Allen is generally credited with discovering anthracite in Schuylkill County, at the foot of Broad Mountain, about the year 1790. Philip Ginter is said to have made the first discovery in the Lehigh region about 1791. C. W. Unger's History of Schuylkill County states it is probable that Thomas Potts was the first to make a real attempt to develop the coal lands, to utilize their contents and to commercialize his discovery. Mr. Unger also writes that William Scull on his map of the Province of Pennsylvania, published April 4, 1770, presents conventional signs on his map marked "coal.")

the Lehigh Coal and Navigation Company and 365 tons of anthracite were mined and shipped to Philadelphia. In 1824 this company produced and sold more than 9500 tons of coal.

The first commercial record of western Pennsylvania coal production was in 1803 when some 350 tons were shipped from Pittsburgh by boat. In 1804 a barge load of coal mined near Clearfield was floated down the Susquehanna River to Columbia. Coal mines around Blossburg were opened in 1806. Up to this time bituminous coal had been used almost entirely locally in iron foundries or forges, glass works, and for domestic purposes; there was little trade that could become a matter of record as to quantity. From these beginnings, which were more or less contemporaneous, coal production in both the anthracite and bituminous regions increased rapidly. Anthracite coal passed the million-ton mark in 1837 while reliable statistics show that 464,826 tons of Pennsylvania bituminous coal were produced in 1840. Bituminous production was approximately equal to that of anthracite between the years of 1895 and 1900, but since that time it has surpassed the latter and in some years has had almost double the quantity.

The coal industry in both the anthracite and bituminous regions was responsible to a great extent for the development of transportation by canal and railroad; in fact, it is hardly unfair to say that it practically brought them into being. Those canals and railroads which were in existence in the early decades of the nineteenth century were used largely for transporting coal, and their capacity for carrying this product became a limiting factor on the amount that could be produced and shipped to the growing industrial centers of New York and Philadelphia. Increasing demand for coal provided the incentive to supplement water transportation by railroads. Much of the building of railroads between 1840 and 1860 was in response to the need of better coal movement, although other commodities were also taking advantage of this better means of transportation. The tremendous increase in coal transported is shown by the statistics of the Pennsylvania Railroad which carries more bituminous coal than any other line. In 1929, seventy years after

the wide-spread building of railroads in the coal regions, this line received more than 116 million dollars for handling bituminous freight, about 18 million dollars for anthracite freight revenue, and over 9 million dollars for carrying coke freight; coal and coke during this year (1929) furnished about 29 percent of the total freight revenue of this company. In 1930, 321,561,726 tons of bituminous coal originated on class I railroads as revenue freight, and 289,102,289 tons were received from conecting lines; the total freight revenue amounted to $718,370,396. The above coal freight, of course, includes production outside of Pennsylvania, but is cited to show the tremendous trade activity which has grown out of the modest beginnings of the early nineteenth century.

The early uses of anthracite included metallurgical purposes, nail production, and similar iron and steel uses. At first anthracite was used mainly in supplying heat and power for these industries, but by 1840 it had almost supplanted charcoal as the reducing agent in blast furnaces. Bituminous coal, or coke made from it in bee-hive ovens did not surpass charcoal in blast-furnace use until 1869. Anthracite continued to be the leading blast-furnace fuel until 1875 when it also was superseded by bituminous coal and coke. Since that time coke has continued to be the favorite.

While coal aided the growth of the railroads and was largely instrumental in fostering the rapid expansion of the metallurgical industries, it became of still greater use to other industries which had formerly depended on wood as fuel. A large increase in the consumption of coal, beginning late in the 19th century and continuing up to the present, has been due to its use for generating power. The old water wheel of a hundred years or so ago, representing a capacity of a few horsepower, utilized the water power where it was available and the use of the electric power generated was limited to that vicinity. This was not an ideal situation for manufacturing purposes where other raw materials involved in the processes were concerned. Later, small isolated steam and steam-electric plants were built where the demand existed; coal could be transported and the plant could be erected at the most suitable point

for the gathering together of the various raw materials used in the manufacturing process. A historic note mentions a rolling mill, presumably one of the first to be constructed in the Pittsburgh district, in 1811 and 1812 which was operated by a "large and powerful engine, 70 H.P." With the coming of electricity for general use, first for lighting and later for power purposes, the small isolated steam plants were gradually abandoned in favor of purchased power transmitted from a large central station plant. Such replacement has progressed to the present day when nearly all industries, excepting a few cases of mining plants, use purchased electric power. A certain number of steam plants, however, are still in use where the exhaust steam can be used either for heating purposes or in industrial processes. Water power for generation of electricity has not been completely displaced. Isolated plants, utilizing high-voltage transmission, still continue to serve certain industrial centers located within suitable distances of the plants, but they represent only 10 or 12 percent of the total power generated. Petroleum products are used to generate a still smaller percentage of the total power used, so that coal is responsible for approximately 80 percent of the tremendous electrical load of our country.

With the coming of better transportation, coal was made available for domestic heating, including office buildings and homes. Anthracite coal early developed a domestic fuel market by reason of its being the nearest and most accessible fuel to the large populations along the Atlantic seaboard. It has retained this market by reason of its being a smokeless fuel, almost regardless of any care in firing. This, of course, is of special advantage in large cities in which smoky fuels would be a nuisance.

The future use of coal, other than the foregoing, is problematical. Much of our bituminous coal may be processed, not only to render it smokeless in combustion but also to recover valuable materials that are lost under the present methods of burning without this processing. Liquid fuels and even lubricants are possible future products of hydrogenation of coal, although they cannot be produced in America today

at a price which will allow them to compete with petroleum products. Rubber is another product which can be obtained from coal although it is not commercially feasible to do so now. This illustrates the many possibilities of coal as a raw product in the manufacturing of necessities at some future date. When one views how largely certain substitutes have supplanted earlier products, such as rayon for real silk, coal tar dyes for natural mineral, vegetable and animal dyes, and synthetic medicines for herb extracts, there must indeed be room for speculation as to the future of coal.

APPENDIX

Mining Terms

The following terms are in common use among mine workers. The miner and laborer should become familiar with the use of these terms and their meanings.

ABANDONED — Deserted; left behind.

ACCIDENT — Any unfortunate occurrence involving human injury.

ACCUMULATION — A collected mass of material.

ACCURATE — Precise; exact; correct.

ADJOINING — To be in contact; to lie next to.

ADVANCE WORKINGS — Workings in the solid strata.

AFTERDAMP — The mixture of gases remaining in a mine after a mine fire or an explosion of firedamp.

AIR BRIDGE also AIR CROSSING — A bridge spanning an opening so that one current of air may pass over another without coming into contact with it. See OVERCAST, UNDERCAST.

AIR COMPRESSOR — A machine for compressing air to a pressure sufficient to operate machinery.

AIR COURSE — A passage through which air is circulated.

AIR CURRENT — A body of air moving continuously in one direction.

AIR LOCK — The passage, closed at both ends by doors, connecting two airways along which currents of air having different pressures are flowing.

AIR PIPE — A pipe of metal for conducting compressed air. Also, a pipe of canvas or wood for conducting low pressure ventilating air to workmen.

AIR SHAFT — A shaft used exclusively for conducting air.

AIR SPLIT — The division of a current of air into two or more parts.

AIRWAY — Any passage through which air is carried.

ALIGNMENT — The act of laying out or regulating by line.

ANEOMETER — An instrument for measuring the velocity of an air current by means of a revolving vane wheel.

ANEROID BAROMETER — An instrument for showing the pressure of the atmosphere by means of a thin-plate diaphragm on a metal box. The diaphragm is connected by levers to an indicating dial hand.

ANGLE OF DIP — also, DIP — The angle an inclined stratum makes with the horizontal.

ANNUAL — Yearly; each year.

ANTHRACITE — Mineral coal of nearly pure carbon; hard coal; from the Greek 'anthrax' or coal. It should be used by itself, not as 'anthracite coal'.

ANTICLINE — An upward fold or arch of rock strata.

ANTICLINAL AXIS — The ridge of an anticline.

APEX — The top of an anticlinal fold. Also, the edge of a vein nearest the surface.

APRON — A hinged extension of a loading chute; also called LIP. It may also be applied to an endless belt made up of short segments of sheet metal, called an APRON CONVEYOR.

ASSISTANT — Generally applied to a foreman in charge of one section of mine. One who assists a superior.

ATMOSPHERE — The whole mass of air surrounding the earth.

AUGER — A tool for drilling holes in coal for blasting.

BALLAST — Broken stone used for keeping track ties in place.

BAND — Slate or rock interstratified with coal. Also called 'slate band', 'sulphur band', etc.

BARRICADE — A barrier hastily built to close a passage against gas or water, also, to mound up earth, roof-high, around an explosive magazine.

BARRIER — Something that bars or keeps out. BARRIER PILLARS are solid blocks of coal left between two collieries or mines to prevent accidents due to inrushes of water or gas.

BARRING-DOWN — To take down by means of a bar.

BASIN — A natural depression of strata containing a coal bed or other stratified deposit.

BATTER — The inclination of the legs of a timber set.

BATTERY — A structure built to keep coal from sliding down a chute or breast. Also, a platform on which miners work. Also, the combination of two or three electro-chemical cells in a case which furnish the current for miners' cap lamps. CHECK BATTERY is used in anthracite mining to close the lower end of a chute and check the flow of coal; also, to keep the air in the breasts.

BED — A stratum of coal or other sedimentary deposit.

BENCH — One of two or more divisions of a coal seam separated by slate or by the process of cutting the coal.

BIT — A drilling chisel. Also, the cutting end of a boring implement. Also, the cutting instrument placed in the chain of a coal cutting machine.

BLACK DAMP — A term generally applied to carbon dioxide. Strictly speaking, it is a mixture of carbon dioxide and nitrogen. It is also applied to an atmosphere depleted of oxygen, rather than having an excess of carbon dioxide.

BLACK POWDER — A granular explosive which is a mixture of 10 percent sulphur, 16 percent wood charcoal, and 74 percent potassium nitrate.

BLAST — To cut or bring down coal or rock by the explosion of dynamite, etc. Also, the sudden rush of fire, gas, and dust of an explosion through the workings of a mine.

BLASTING CAP — A copper shell, closed at one end, containing a charge of detonating compound which can be ignited by a spark of the fuse.

BLASTING MACHINE — A portable dynamo for firing blasts electrically.

BLASTING POWDER — It differs from black powder in having less potassium nitrate (65 to 75 percent) and more charcoal (15 to 20 percent). In the United States sodium nitrate is largely used in place of the potassium salt.

BLOWN-OUT SHOT — A shot that has blown out the stemming without breaking any of the coal except that around the auger hole.

BOND — An electrical connection, usually of copper wire, between two rails at the joint formed where they meet.

BONDING — The act of applying a bond, usually by arc welding.

BONE — Slaty coal or carboniferous shale found in the coal seam. Also called BONE COAL, or BONY COAL.

BOREHOLE — A hole made with a drill, auger, or other tools for exploration work for blasting purposes, etc.

BOSS — A person having immediate charge of a piece of work.

BOTTOM COAL — Coal below the undercut. It may or may not be removed.

BOUNDARY — That which fixes the limit or extent of a property or territory.

BRAKEMAN — The man in charge of the coupling or uncoupling of mine cars, the applying of brakes, the operation of track switches, etc. He is also called a SNAPPER TRIP RIDER, or CAR COUPLER.

BRAKE SHOE — That part of a brake which rubs against some part of the machine to retard its motion.

BRATTICE — A lining or partition of board, plank, or other material in any mine passage to confine the air and force it into the working place. Also termed LINE BRATTICE.

BREAK LINE — The line which roughly follows the rear edges of coal pillars that are being drawn. The line in which the roof of a coal mine is expected to break.

BREAKER — In anthracite mining, the structure in which the coal is broken, sized, and cleaned for market.

BREAKTHROUGH — A narrow passage for ventilation which is cut through the pillars between rooms.

BREAST — A chamber driven from the gangway for the extraction of coal.

BRIDLE CHAINS — Safety chains to support the cage if the shackle should break. Also, chains to protect a train of cars on a slope should the shackle or drawbar fail.

BROKEN COAL — In anthracite mining, the coal which will pass through 4⅜ inch round holes and over 3¼ inch round holes.

BUG DUST — The fine particles of coal or other material resulting from the boring or cutting of the coal face by drill or machine.

BUGGY — A small wagon used for short transportation of coal in an anthracite mine.

BUMPER — A fender for lessening the jar caused by the collision of cars or other moving equipment.

BUNTON — The horizontal cross-timber braces in shaft timbering.

BURDEN — Valueless material overlying coal which must be removed in stripping operations before the coal is mined; frequently called OVERBURDEN. Also, the distance between the charge and the free face of the coal being blasted.

CABLE — A steel rope for hoisting or hauling. The term ROPE is frequently used in its place.

CAGE — A frame with one or more platforms for cars, used in hoisting in vertical shaft.

CAGE GUIDES — Vertical rods of metal or wood, placed on two opposite sides of a cage compartment, which serve as the 'track' to steady and guide the cage in its travel.

CAGER — One who places cars on the cage. See BOTTOM CAGER: TOP CAGER.

CANVAS — The term is usually applied to BRATTICE CLOTH, which is a heavy canvas of cotton, hemp or flax, frequently fireproofed.

CAP — The piece of plank on top of a prop; also termed CAP PIECE. Also, the cone of blue flame above the non-luminous testing flame of a safety lamp when firedamp is present; frequently called GAS CAP.

CARBON — One of the elements. It occurs pure in nature as diamonds and graphite, and also as a constituent of coal, petroleum, and other organic compounds.

CARBON DIOXIDE — A heavy, colorless, odorless, suffocating gas with the chemical formula, CO_2. It is formed by the complete combustion of carbon through explosions of gas and powder, the breathing of men and by slow oxidation.

CARBON MONOXIDE — A colorless, odorless, poisonous gas with the chemical formula, CO. It is formed by incomplete combustion of carbon in mine fires and explosions. See WHITEDAMP.

CARTRIDGE — A cylindrical, waterproof, paper shell, filled with high explosive and closed at both ends. Also called STICK.

CAVE-IN — The partial or complete falling in of a mine.

CERTIFICATE — A written declaration or testimonial. For example, an assistant mine foreman's certificate. Miners frequently use the term 'papers' in referring to certificates issued to fire bosses, mine foremen, etc.

CHAIN PILLAR — The pillar left to protect the gangway or entry and the parallel airway.

CHARGING — The loading of a borehole with explosives. It may also

include the arranging of the fuse or squib, and the tamping of the hole with stemming material.

CHECK — The stamped metal tag placed on each loaded car to identify the loader; also called TICKET or TAG. This term is also applied to slit canvas or brattice cloth, called a CHECK CURTAIN, placed across a passage to prevent the flow of air while still permitting the passage of men and equipment. To CHECK also means to verify some statement.

CHECKWEIGHMAN — A person employed by the miners to check the work of the weighboss as the loads are weighed.

CHUTE — In anthracite mining, an opening connecting the gangway and an airway.

CLEARANCE — The space between the top or side of a car and the roof or rib of the passage.

CLEVIS — A U-shaped iron used with an iron pin for connecting ropes to the drawbars of cars or, when used with iron links, for coupling cars together.

COLLAR — When referring to mine shafts, the first horizontal timber or wood frame of the shaft. Also, the bar or crosspiece of a framed timber set in entry timbering.

COMBUSTION — The act or process of burning.

COMPASS — An instrument employing a magnetic needle turning in a horizontal plane, used for determining directions.

CONDUIT — A tube or trough for receiving and protecting electric wires.

CONVEYOR — Any mechanical contrivance, such as endless chains or belts, for carrying material.

COUNTERGANGWAY — A level or gangway driven at a higher level than the main gangway.

COUPLING — A link or chain for connecting cars. Also, a device for joining two rope ends without splicing.

COURSE — To conduct ventilation currents through a mine by means

of properly arranged stoppings and regulators. Also, a corridor or passage in a mine. Also, the direction of a passage, or of a survey line, etc.

CREEP — The forcing of pillars into soft bottom by the weight of a strong roof.

CRIB — See CHOCK.

CROP COAL — Coal at the outcrop of the seam, it is usually considered of inferior quality due to partial oxidation, although this is not always true.

CROPPING OUT — To be exposed at the surface.

CROSSBAR — A horizontal timber held against the roof for its support, usually over a roadway. See COLLAR.

CROSSCUT — A small passageway driven between the entry and its parallel air course or air courses for ventilation purposes.

CROSS ENTRY — An entry running at an angle with the main entry.

CROSS HEADING — In anthracite mining, a passage between the airway and gangway or between breasts for ventilation purposes.

CRUSH — A general (over a large area) settlement of the mine roof and overhead strata due to the failure of pillars.

CULM — The waste or slack of the Pennsylvania anthracite mines.

CURTAIN — A sheet of canvas or brattice cloth used to control and deflect an air current. See CHECK.

CUTTER — Applied to coal-cutting machines or to the men who operate them.

CUT-THROUGH — Is used interchangeably with breakthrough.

DANGER BOARD — A board on which a warning is given against entering a dangerous part of the mine workings.

DANGER SIGNAL — It may be a board, shovel, or a metal sign with a prepared warning, placed in front of the entrance or entrances to dangerous parts of the mine.

DEADWORK — Work that is not directly productive of coal although it may be necessary for maintenance or exploration.

DETONATOR — Blasting caps or similar devices used to explode a high explosive.

DEVELOPMENT — Work done to open up a deposit for mining.

DIP — The angle at which beds or strata are inclined from the horizontal. A DIP ENTRY is one going to the dip. DIP WORKINGS are those in the lower portions of a mine.

DOG — Any of the various devices for holding, gripping, or fastening something. CAGE DOGS grip the guides if the hoisting rope breaks. The term is also applied to the drag behind a car or trip of cars being hauled up a slope.

DOOR — A movable frame or barrier of boards or other material, usually turning on hinges or pivots, by means of which a passage may be opened or closed. In coal mines, doors are used in directing the ventilating current; also called TRAPDOORS.

DOUBLE-ENTRY — A pair of entries in a flat-lying coal seam, from which rooms can be driven off either entry. It is also applied to ventilation with two parallel entries, one of which is used for intake air while the other carries the return air.

DOWNCAST — The shaft through which fresh air is forced or drawn into a mine.

DRAG — See DOG.

DRIVER — Ordinarily applied to a person who drives a horse or mule.

DRUMMY — The condition of loose coal or roof rock that produces a hollow sound when tapped with any hard substance.

DUMMY — A paper bag filled with sand, clay etc., used for stemming a charged bore hole.

DYNAMITE — Any high explosive of a detonating character, used for blasting purposes, which contains nitroglycerin. Also to shatter or blow up with dynamite.

EGRESS — A place of exit.

EMERGENCY — A sudden condition calling for immediate action.

EMPLOYEE — One who is hired to work by another.

EMPTIES — Empty mine cars.

ENDLESS ROPE — A system of haulage by moving of an endless rope.

ENGINE PLANE — An incline up which empty or loaded cars are drawn by an engine. They descend by gravity.

ENGINEER — One versed in any branch of engineering. Also, anyone who manages or runs a stationary engine or a locomotive.

ENTRY — An underground passage used for haulage, ventilation, or as a manway.

EXCAVATION — The act of removing material so as to form a cavity.

EXPLOSION PROOF — An inclosure that is so constructed as to prevent ignition of surrounding gases by any spark, flash, or explosion of gas that may occur within such inclosure.

EXPLOSIVE — Any mixture or chemical compound by whose decomposition or combustion gases are formed with such rapidity as to make it suitable for blasting or in firearms.

EXTINGUISH — To put out; to quench.

FACE — In any tunnel, slope, breast, chamber, room, or entry, the end at which work is progressing or was last done. Also called WORKING FACE.

FALL — A mass of roof rock or coal from the side which has fallen in any part of mine.

FALSE SET — A temporary set of timber used until the permanent set is ready for installation.

FANS — Rests placed on shaft timbers to hold the cage when it is brought to rest at the top, bottom, or any intermediate landing. Also, stops fitted on a cage to prevent cars from running off.

FAN DRIFT — A short tunnel or passage leading from the top of the airshaft to the fan.

FAULT — A break in the continuity of a body of rock, attended by movement (up, down, or sideways) on one side or the other.

FEEDER — See BLOWER — Also, a device for feeding coal uniformly to screens or to jigs.

FENCE — An obstruction, such as a bar or cross-sticks, placed across an underground passage to prevent men from passing beyond to possible dangerous territory. Also, rails fixed around a shaft mouth or at landings to keep people or objects from falling in.

FIRE — To blast with explosives. A warning given before a shot is fired. Fuel in a state of combustion.

FIREDAMP — The combustible gas, methane, CH_4. Also, the explosive methane-air mixtures with between 5.3 and 14 percent methane.

FIRING — The act of blasting coal.

FIRST AID — The treatment of injured or sick persons before medical aid has been given.

FISH PLATES — The metal bars used to join rails of track where they meet to form a joint. Also called SPLICE BARS.

FLANGE — A projecting ledge or rim; wheel flange.

FLOOR — The rock underlying a flat-lying coal seam, upon which miners walk and on which track is laid.

FLUSH — To fill underground spaces in coal mines with material carried by water, which forms a compact mass after drainage.

FOREMAN — See BOSS.

FOREPOLING — A method of securing drifts in progress in broken or running ground by driving ahead over the last timber set poles, laths, slabs, etc., to prevent the loose material on the top and side from falling.

FOUNDATION — A structure, wholly or partially of masonry or concrete, on which a building or a machine is erected.

FRACTURE — The character or appearance of a freshly broken surface of any rock or mineral.

FRAME SET — The legs and cap or crossbar arranged so as to support the roof of an underground passage. Also called FRAMING, SET or TIMBER SET.

FUMES — The gas and smoke, more especially the noxious or poisonous gases, given off by the explosion, detonation, or burning of high explosives and blasting powder.

FUSE — A center thread surrounded by a train of fine-grained powder and enclosed in various wrappings of hemp, jute, or cotton and various water proofing material. Also, to melt.

GANGWAY — The main haulage road or level. In Pennsylvania, generally confined to anthracite mines.

GASEOUS — Pertaining to gases.

GASSY — Applied to any mine which generates methane or any other gas.

GAUGE — Also GAGE — An instrument for measuring or indicating. WATER GAUGE for measuring differences in ventilation pressure; STEAM GAUGE for measuring the steam pressure, etc.

GAS DETECTOR — A device to show the presence of firedamp or other gases in a mine. See SAFETY LAMP, METHANE DETECTOR.

GEOLOGY — The science which treats of the history of the earth and its life, especially as recorded in the rocks.

GOB — The term applied to that part of the mine from which the coal has been removed and the space more or less filled up with waste. Also, the loose waste in a mine.

GOBBING — The act of stowing waste in a mine.

GRAVITY ROAD — Any road on which cars will descend by gravity. A GRAVITY PLANE usually has loaded cars or skips running downhill and pulling empty cars or skips uphill at the same time.

GUARD BOARDS — Boards placed alongside and extending below trolley and other power wires which are not more than 6½ feet above the rail at crossings where men and animals must pass under, to protect them from contact with the power wires.

GUARD RAIL — An additional rail placed beside the track rail in service to compel the flange of the wheels to run close to the latter in crossing over frog points, or entering switches.

GUNBOAT — A self-dumping box on wheels, used for raising or lowering coal in slopes; a MONITOR: a SKIP.

HAULAGE — The conveying of coal in cars or otherwise from the place where it is mined to the place where it is to be hoisted, treated, used, or stored.

HAULAGEWAY — The gangway, entry, or tunnel through which loaded or empty mine cars are hauled by animals or mechanical power. The words HAULAGE ROAD are frequently used instead.

HEAD — The pressure in feet of water column. Also, any underground passage driven in solid coal. Also, that part of the face nearest the roof.

HEADFRAME — A structure erected over a shaft to carry the sheaves for the hoisting cable.

HEAD HOUSE — The house or building that encloses the headframe.

HEADING — Used interchangeably with entry. Also, in anthracite mining, the connecting passageway between breasts, similar to breakthroughs in bituminous coal mining.

HEADPIECE — A cap or collar in timbering.

HEAVING — Applied to the rising of the bottom after removal of the coal.

HELMET — A hard hat worn for protection from falling objects.

HITCH — A hole cut in the side of a passage to permit the placing of a crossbar for roof support without the use of legs or props.

IGNITER — A device to relight safety lamps internally by friction.

IGNITION — The act of igniting, or the state of being ignited.

INCOMBUSTIBLE — Will not burn.

INFLAMMABLE — Readily inflamed or ignited. The word FLAMMABLE is frequently used instead.

INSULATOR — A non-conducting substance or body used to insulate or support electric wires.

INTAKE — The passage through which fresh air is drawn or forced into a mine or to a section of a mine.

JACK — A jack-screw, also called a pipe-jack, attached to a pointed pipe and used to hold cutting machines in position while at work. Also, a rod or post set up in a working place, to which a rope is fastened to move the cutting machine while at work.

JACKHAMMER — A non-reciprocating or hammer type of rock drill worked without a tripod. It is provided with an automatic rotating device, and uses hollow drill steel through which the exhaust air passes to blow the cuttings out of the hole.

JIM CROW — A machine with a V-shaped head, having claws on either end and a bolt passing through the middle of the bend, used for bending or straightening rails.

KERF — The undercut of a coal face.

KOEHLER — The name of a naphtha-burning flame safety lamp.

LABORER — A man hired by a contract miner. Also, the man who works by the day in or about the mine; a company man, not a loader.

LAGGING — Planks, slabs, or small timbers placed over the caps or behind the posts of timbering to prevent fragments of rock from falling through.

LAMP MEN — Cleaners, repairers, and those who have charge of mine lamps.

LANDING — A level stage for loading or unloading a cage or skip. Also, the top or bottom of a slope, shaft, or inclined plane.

LEGS — The upright of a set of mine timbers.

LEVEL — A horizontal passage or drift into a mine. In anthracite mining, there may be several levels from the same shaft, each being known by its depth from the surface.

LIFT — The vertical height traveled by a cage in a shaft. Also, the distance between levels. It is also used interchangeably with level to indicate gangways from which coal is raised.

LOADED TRACK — A track used for loaded mine cars.

LONGWALL — A system of mining coal in which all of the coal is removed except the shaft pillars and sometimes the main-road pillars.

LUMP COAL — Prepared coal over 4 to 6 inches (depending on the screening practice) in size.

MACHINE — Any coal-cutting device.

MACHINE MAN — The man who operates a coal-cutting machine.

MAGAZINE — A storage place for explosives.

MAIN ENTRY — A main haulage road. Where the coal has cleats, main entries are driven at right angles to the face cleats.

MANHOLE — A refuge hole constructed in the side of a gangway, tunnel, or slope.

MANWAY — An entry used exclusively for men to travel from the shaft bottom or drift mouth to the working sections; it is always on the intake air in gassy mines. Also, a small passage at one side or both sides of a breast, used as a traveling way for the miner, and sometimes as an airway, or chute, or both.

MARSH GAS — A term for methane.

MASONRY — That which is built by masons; stonework; brickwork.

MATCH — A charge of gun powder put into a paper several inches long, and used for igniting explosives, also the touch end of a squib.

METHANE — A gaseous hydrocarbon, CH_4, known as 'gas' to the miner, light, odorless, inflammable, explosive between 5.3 and 14 percent in air. Also known as marsh gas or light carbureted hydrogen.

METHANE DETECTOR — Any device, including safety lamps M.S.A. or U.C.C. detectors, and other special detectors, by which the presence or percentage of methane present in the mine air can be detected.

MINER — This term is used in the broad sense to include all classes of workmen in a mine. It is also used to designate the men who dig or blast out the coal and load it, as compared with trackmen, timberman, etc. If the coal is cut and blasted by persons other than the man who loads it, the latter is also termed a LOADER.

MINE RUN — The unscreened coal, just as it is mined, less dirt and slate.

MINING — The business of working mines. Also, the excavation made in undermining a coal face.

MINING ENGINEER — One who is versed in or follows the business of mining engineering.

MISFIRE — The failure of a blasting charge to explode when expected.

MONKEY — When placed before another word means "small." For instance, a MONKEY CHUTE is a small chute; a MONKEY DRIFT is a small drift. In anthracite mining, a MONKEY HEADING is a small passage or aircourse between breasts just above the chute, used for ventilation purposes; a MONKEY GANGWAY is a small gangway driven parallel to the main gangway at a higher level; MONKEY ROLLS are the smaller rolls in an anthracite breaker.

MOTOR — Specifically applied to devices that receive electrical power and transmit it as mechanical power to machines. It is also applied to haulage engines or locomotives operated by electricity or compressed air.

MOTORMAN — The man who operates a haulage locomotive.

MUD CAP — A charge of high explosive fired in contact with the surface of a rock after being covered with a quantity of wet mud, wet earth, or sand, without any borehole being used. Also termed ADOBE, DOBIE, and SANDBLAST.

MUDSILL — The lowest sill or bottom crosspiece of timber set.

NAPHTHA — An artificial, volatile, colorless liquid obtained from petroleum. It is used in safety lamps.

NEEDLE — A copper or brass rod, with a handle at one end and pointed at the other end, about ½ inch in diameter and 3 to 4 feet long, which is thrust into a charge of powder and the stemming material packed around it before it is withdrawn, leaving a smooth-walled hole for the miner's squib to shoot or fire the charge.

OPERATOR — The person, whether proprietor or boss, actually operating a mine.

OUTCROP — That part of a stratum which comes to the surface. It may be visible or may be covered with a thin layer of earth.

OUTLET — The passage by which the ventilation current passes out of a mine. The same as RETURN, RETURN OPENING, or UP-CAST. Also, any opening from a mine to the surface.

OUTPUT — The amount of coal put out from a mine during a given time.

OVERCAST — The passage by which an air current is conveyed across an entry or air-course carrying another air current. An AIR-BRIDGE.

OXYGEN — A colorless, tasteless, odorless, chemically active, gaseous element, sp. g., 1.105, chemical symbol O_2, one-fifth of the atmosphere.

PANEL — A group of breasts, chambers, or rooms, separated from the other workings by large pillars.

PERMISSIBLE — That which is allowable or permitted. It is most widely applied to mine equipment and explosives of all kinds which are similar in all mines and can be used with safety in accordance with specified conditions where hazards from explosive gas or coal dust exist.

PICKING TABLE — A flat, or slightly inclined, platform on which coal is run to be picked free from slate. Persons doing this are called PICKERS, or SLATE PICKERS.

PILLAR — A solid block of coal left to support the roof or hanging wall in a mine.

PILLAR-ROBBING — The systematic removal of the coal pillars between rooms or chambers to regulate the subsidence of the roof. Also termed BRINGING BACK THE PILLAR, DRAWING THE PILLAR, or PULLING THE PILLAR.

PINCH — A compression of the walls of a vein or the roof and floor of a coal seam so as to pinch out the coal.

PITCH — The dip or inclination of a seam; the rise of a seam.

PLAN — The system on which a mine is worked. Also, the map showing surface buildings and underground workings of a mine.

PLOT — A surveyor's or engineer's map of a piece of ground. Also, to locate on a map some point, curve, diagram, or plan.

POWDER — Generally applied to all explosives used in coal mines; specifically applied to black blasting powder.

POWER HOUSE — The building in which the equipment for generation of the electricity used in the mine is housed. POWER PLANT generally is used when the building houses the boilers, in which steam is generated for driving the turbines, or engines which furnish the mine power.

PRESSURE FAN — A blower fan.

PRIMER — A dynamite cartridge, or package of any explosive, which contains the detonator by which the charge will be set off.

PROP — A timber set upright or at right angles (nearly) to the dip to support the roof rock.

PULLEY — A wheel or sheave with a grooved rim, over which a rope will pass.

PUMPER — A person who operates mine pumps.

REGULATOR — A device for regulating the quantity of air which will flow through various ventilation splits.

RESCUE — To remove live men or dead bodies from a mine after a mine disaster. RECOVERY may be applied to rescue work but is intended to mean the putting of the mine in shape for operation again.

RESPIRATOR — A device worn by men who work in the mines, which screens out any dust which might be present in the inhaled air.

RETREATING SYSTEM — A system of robbing pillars in which the ROBBING LINE, or line through the faces of the pillars being drawn, retreats from the boundary toward the shaft or mine mouth.

RETURN — The air course along which the vitiated air of the mine is returned or conducted to the upcast shaft. The terms RETURN AIRWAY and RETURN AIR COURSE are synonymous with return.

RETURN AIR — The air or ventilation that has passed through the workings.

RIB — The side of a working place, the solid coal on the side of any underground passage. Sometimes used in places of PILLARS.

ROADWAY — An underground haulage passage. Sometimes applied to passages through which men travel to and from their work.

ROBBED OUT — That part of a mine from which the pillars have been removed.

ROCK TUNNEL — A tunnel driven through rock, usually to connect one pitching coal bed with another.

ROLL — A high place in the bottom or a low place in the top of a mine passage.

ROOF — The rock above a coal bed. The hanging wall.

ROOM AND PILLAR — A system of mining in which 50 percent of the coal is mined advancing by driving wide rooms off entries and leaving narrow pillars between. The pillar coal is removed by any of several robbing practices.

ROOM NECK — The short passage from the entry to the room in which the miner works.

SAFETY CATCH — A device fitted to a cage and operating against the cage guides which prevents the cage from falling if the supporting cable breaks. Also used in inclines with cars.

SAFETY GATE — An automatically operated gate at the top and intermediate landings of a shaft, to prevent anyone from falling into the shaft.

SAFETY LAMP — A lamp with gauze covering every opening from the inside to the outside (in a few cases small diameter tubes form a part of the lamp but these protect, just as the gauze does) so as to prevent the passage of flame should explosive gas be encountered.

SCRAPER — A tool for cleaning the dust out of a bore-hole. Also, the machineman's helper who scrapes the coal away from a shortwall machine as it cuts across a face.

SCREEN — A sieve of wire cloth, grate-bars, or perforated sheet iron, used to separate coal into various sizes.

SEAM — A stratum or bed of coal.

SECTION — A division of the mine workings.

SET — A timber frame for supporting the sides of a shaft or other excavation. Also, to fix a prop or sprag in place.

SHEAVE — See PULLEY.

SHIFT — The length of time a miner works in one day. Also, the gang of men working in one period; DAY SHIFT, NIGHT SHIFT. A SHIFT BOSS is the foreman in charge of a shift of men.

SHOOT — SEE BLAST.

SHOOTING-OFF-THE-SOLID — To blast out the coal without first undermining or shearing it.

SHOT — A charge or blast. Also, the firing of a blast. Also, injured by a blast.

SIDING — A short piece of track laid parallel to the main track, to serve as a passing place.

SINGLE ENTRY — Applied to ventilation where the entry serves as intake and the air returns along the face of the rooms.

SKIP — A mine car. Also, a car for hoisting out of a slope. Also, thin slice taken off a breast or room pillar along its length.

SLANT — Any short inclined crosscut connecting the entry with its air course to facilitate the hauling of coal, where the coal bed is not level. See shoo-fly.

SLANT CHUTE — A chute driven diagonally across a pillar, to connect a breast manway with a manway chute.

SLATE — A miner's term for any shale or slate accompanying coal. Geologically, it is a dense, fine-textured, metamorphic rock, which has excellent parallel cleavage so that it breaks into thin plates or pencil-like shapes.

SLIP — A fault. A smooth joint or crack where the strata have moved upon each other.

SLOPE — A plane or inclined roadway, usually driven in the seam from the surface. A ROCK SLOPE is one driven across strata to connect two seams; also, a slope driven from the surface to intersect a seam that does not outcrop.

SLUSH — To fill mine workings with sand, culm, etc., by hydraulic methods.

SOLID WORKINGS — Workings driven in the solid coal.

SOUNDING — Tapping on a roof to see whether it is sound or safe to work under.

SPAD — A nail with a hole in the head, for driving into mine timbers, or into a wooden plug fitted into the roof, to make a survey station.

SPLIT — See AIR SPLIT. Also, any division or branch of the ventilating current. Also, the workings ventilated by one branch. Also, any member of a coal bed split by thick partings into two or more seams. Also, to divide a pillar by driving through it one or more roads.

SPRAG — A short wooden prop set in a slanting position for keeping up the coal during the cutting operations. Also a short round piece of hardwood, pointed at both ends, to act as a brake when placed between the spokes of a mine car wheel. Also, heavy slanting props wedged against the coal to keep it from flying when blasting.

SQUEEZE — See CREEP.

SQUIB — A small diameter paper tube filled with gunpowder, and having a slow match at one end. It is used to fire powder shots by having the squib travel, due to the propelling force of the powder, through the needle hole of the stemming to the charge.

STEMMING — The noncombustible material used on top of a charge of powder or dynamite.

STOPPING — An air-tight wall built across any passage in a mine.

STRATIFIED — Formed or lying in beds, layers, or strata.

STRATUM — A bed or layer of rock.

STRIKE — The course or bearing of the outcrop of an inclined bed or structure on a level surface. Also, the direction or bearing of a horizontal line in the plane of an inclined stratum, joint, fault, cleavage plane, or other structural plane. It is always perpendicular to the dip direction.

STRIP — To mine a deposit by first taking off the overlying burden.

STUMP — Any small pillar. Also, the small pillars left between a gangway or airway and the breasts or between the entry and the rooms to protect these passages.

SUBSTATION — The place where power is converted to the type (usually direct current) and voltage necessary for the mining equipment before it is fed into the mine power system.

SULPHUR — A non-metallic element, the term is also applied to iron sulphides occurring in coal seams.

SUMP — A catch basin into which the drainage of the mine flows or is pumped, and from which the water is pumped to the surface.

SUPERINTENDENT — The person who shall have on behalf of the operator, immediate supervision of one or more mines.

SWITCH — The movable tongue or rail by which a train is diverted from one track to another. Also, a movable arm for changing the course of an electric current.

SYSTEMATIC TIMBERING — Placing mine timbers according to a predetermined plan, regardless of roof conditions.

TAIL ROPE HAULAGE — A system of rope haulage by which full cars with the tail rope attached are pulled to the outside by a main rope passing over a drum. After the cars have been dumped, the trip is pulled back into the mine by the tail rope which passes over another drum. Both drums are connected to the same engine but are operated separately.

TAMP — To fill the bore hole or other opening with stemming material after the blasting charge has been placed.

TAMPING — This term is used to designate the act of placing the stemming material in a borehole. Also, to designate the material itself and in this sense is used interchangeably with STEMMING.

TIE — See CROSSTIE — Also, any beam, post, or rod used to hold parts (of a structure) together.

TIE PLATE — A metal plate used under rails where they rest on ties. The rail is spiked to the tie through holes in the plate.

TIMBER — Any of the wooden props, posts, bars, collars, lagging, etc., used to support mine roof. Also, to set or place timbers. Also, any steel or concrete joist or beam used in place of wooden timbers in a mine.

TIMBERMAN — One who cuts, frames, and puts in place any of the timbers used in a shaft, slope, mine, or tunnel. The term is also applied to any person who draws or recovers props or posts.

TIMEKEEPER — One whose duty is to make and keep a record of the number of hours or days worked by laborers or other employees.

TOPMAN — Any man employed on the surface about a mine.

TOPPING — The coal on a mine car above the top of the car sides.

TRACKMAN — Any workman engaged in laying track or keeping it in good repair. Also called TRACK LAYER.

TRANSIT — A surveying instrument with the telescope mounted on a frame to which horizontal and vertical scales are attached, by which horizontal and vertical angles can be measured.

TRANSPORTATION — The hauling or moving of coal or supplies in a mine or on the surface about a mine.

TRAVELING ROAD — or TRAVELING WAY — An underground passage used expressly, but not always exclusively, for men to travel along to and from their working places.

TRIP — A train of mine cars. Also, an automatic arrangement for dumping cars.

TRIPLE-ENTRY — A system of opening a mine, or section of a mine, by driving three parallel entries.

TROLLEY — or TROLLEY WHEEL — The grooved wheel, fixed in bearings at the end of a TROLLEY POLE, pressed upward in rolling contact with the overhead TROLLEY WIRE to take off the electric current for operating the locomotive or other piece of motorized equipment. A TROLLEY GLIDER is frequently used in place of the wheel, making a sliding contact with the wire.

UNDERCAST — An aircourse carried under another aircourse or roadway.

UPCAST — The shaft or opening through which the return air current is carried to the surface.

VACUUM FAN — An exhaust fan. One that creates suction or a partial vacuum.

VEIN — The filling of a fissure or fault in a rock, particularly if deposited by aqueous solutions. The term is often applied incorrectly to a seam or bed of coal.

VENTILATE — To cause fresh air to circulate through a room, a mine, etc.

VENTILATION — The atmospheric air circulating in a mine. Also, the method of producing, distributing, maintaining, conducting, and regulating a constant current or flow of atmospheric air in mine shafts, levels, inclines, etc.

VIRGIN COAL — A coal seam or part thereof in which no mining operations have been carried on.

WASHERY — A place where coal is freed from its impurities by a washing process.

WASH HOUSE — A building on the surface at a mine where the men can wash before going to their homes. A CHANGE HOUSE, or a DRY HOUSE.

WASTE — That which has no real value. In coal mines it includes rock, fine coal for which there is no market, impurities removed in mining or preparing the coal, and dirty or high-ash coal. It is also applied to the coal pillars left in the mine.

WATER GAUGE — See GAUGE. The term is also used to denote the ventilating pressure in inches of water column.

WHITE DAMP — Carbon monoxide and air.

WOLF — The name of a naphtha-burning flame safety lamp.

WORKABLE — Any coal seam that can be profitably mined.

WORKED-OUT — Exhausted. A mine or mine section from which all the available or economically valuable coal has been removed.

WORKING — Making a noise before falling down, such as undermined coal at the face, or unsupported roof strata. When used in the plural as WORKINGS, it means all of the underground developments in a general sense, and the breasts or rooms in a stricter sense.

WORKING PLACE — The place where work is being done. See FACE.

YARDAGE — The compensation a miner receives in addition to the scheduled price per ton of coal for working in a narrow place or in one where there is considerable rock in the face. It is paid as so much per yard of advance.

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